REPORT OF THE CHIEF OF THE BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE, 1935

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE,
Washington, D. C., September 16, 1935.

Hon. HENRY A. WALLACE,
Secretary of Agriculture.

DEAR MR. SECRETARY: I submit herewith a report of the work of the Bureau of Entomology and Plant Quarantine for the fiscal year ended June 30, 1935.

Sincerely yours,

LEE A. STRONG, *Chief.*

INTRODUCTION

In accord with the reorganization directed by the Secretary and approved by Congress, the investigational work on insects previously carried on in the Bureau of Entomology and the activities concerned with control and eradication of plant pests and the enforcement of plant quarantines previously carried on in the Bureau of Plant Quarantine, together with the functions concerned with the control and eradication of plant diseases directed by the Bureau of Plant Industry, were consolidated at the beginning of the fiscal year into the newly created Bureau of Entomology and Plant Quarantine. Effective September 1, the chemical work on insecticides and fungicides previously carried on in the Bureau of Chemistry and Soils was transferred, by order of the Secretary, to the Bureau of Entomology and Plant Quarantine. These investigations on the chemistry of insecticides continued under the direction of R. C. Roark as leader of the Division of Insecticide Investigations. The unfortunate and untimely death of Karl F. Kellerman, who had charge of the Division of Plant Disease Control of the Bureau of Entomology, was followed by the reassignment of certain activities previously carried on in that unit. Stanley B. Fracker, who had been in charge of the Division of Domestic Plant Quarantines of the Bureau of Plant Quarantine, was designated as leader of the Division of Plant Disease Control and the scope of the Division restricted to work concerned with the control and prevention of spread of white pine blister rust and black stem rust of small grains. B. M. Gaddis was placed in charge of the Division of Domestic Plant Quarantines and the scope of the Division enlarged to include activities on the control and prevention of spread of the phony peach disease and citrus canker. The field direction of the work on the eradication of the Dutch elm disease was assigned to L. H. Worthley, who continued as field leader in charge of work on control and prevention of spread of the Japanese beetle and certification of products to meet the requirements of Federal and State quarantines on this pest, the gypsy, brown-tail, and satin moths, and the European corn borer. Investigations on the physiology and toxicology of insects, handled as a unit in the Bureau of Entomology, were consolidated with those concerned with the commercial application of control measures in the Bureau of Plant Quarantine, under the direction of L. A. Hawkins. The service and investigational work on insects attacking shade trees was assigned to the Division of Forest Insect Investigations.

During the fiscal year the regular and special activities concerned with the control and prevention of spread of the gypsy moth, the eradication of bar-

berry as an aid in combating black stem rust, and the control and prevention of spread of white pine blister rust, were financed under allotments of emergency funds rather than being provided for in the regular appropriations made for the work of the Bureau. Special allotments of emergency funds were also made available to aid in the eradication of the Dutch elm disease and measures to suppress an infestation of the Japanese beetle discovered at St. Louis, Mo.

INSECT PEST SURVEY AND INFORMATION

During the year the Survey added to the permanent files of information on the distribution and abundance of insects over 12,000 notes on American insect pests and over 7,000 on insect pests of other countries, bringing the total number now available for consultation to over 226,000. A new feature of the mimeographed Insect Pest Survey Bulletin was started by issuing supplemental numbers as an avenue for the publication of more extensive and detailed survey reports on special subjects, such as The Species and Distribution of Grasshoppers Responsible for the 1934 Outbreak, and Insect Notes from Costa Rica in 1934.

During the year, 116 articles covering various phases of the activities of the Bureau were released to the press. A complete program for radio releases was prepared for the year and 39 talks were put on the air. The use of film strips as a means of visual education has been very greatly stimulated during the year. The construction of a comprehensive exhibit on the activities of the Bureau, to be shown at the San Diego Exposition, was planned and supervised. During the year over 100,000 publications were distributed, exclusive of those sent out on regular mailing lists and miscellaneous mimeographed material prepared from time to time.

FRUIT INSECT INVESTIGATIONS

APPLE INSECTS

The major portion of the funds available for the work on apple insects, including a special allotment made by the Public Works Administration, was used for investigations on the codling moth in an effort to develop a satisfactory and practical means of controlling the insect that does not result in objectionable residues at harvest time.

The large-scale tests of various insecticides carried on during the calendar year 1934 at numerous points indicated that lead arsenate is still the most generally satisfactory material available, although not fully effective in the control of severe infestations. Closely approaching lead arsenate in effectiveness was the nicotine-oil treatment, which, however, involves certain difficulties in practical use. The fixed nicotine materials, nicotine bentonite and nicotine tannate, gave indications sufficiently favorable to warrant the hope that a practical insecticide may exist somewhere in this group of materials. Mixtures of ground derris, cube, and pyrethrum with kaolin, applied as sprays, were ineffective for codling moth control. Laboratory studies to develop new and less objectionable insecticidal compounds, preliminary to more extensive field experimentation with the more promising materials, were continued. During the 1935 season extensive tests are being made with phenothiazine, a material which is made by fusing sulphur with diphenylamine. This compound was first prepared by the Insecticide Division, and in laboratory experiments in 1934 it was found to be very toxic to codling moth larvae. Preliminary results of both field and laboratory experiments in the season of 1935 are very encouraging, although, when combined with mineral oil and with soybean oil, the material has caused serious injury. Much further field work is of course needed before the exact possibilities and limitations of this material can be determined.

The large-scale experiment conducted in 1934 in southern Indiana in which one-half of a 40-acre orchard was thoroughly cleaned up and banded indicated that these practices reduced the injury to the fruit by the codling moth by 30 to 50 percent, thus furnishing experimental proof of the soundness of the present recommendations. Experiments with orchard sanitation and banding are being carried on in southern Indiana, West Virginia, Washington, and Oregon, and include detailed experiments with banding to determine the exact load of the chemical mixture needed for full effectiveness under conditions existing in various regions.

In cooperation with the Yakima, Wash., Fruit Growers Association, experiments have been carried on with the sterilization of orchard boxes and other containers. By passing them through live steam in an insulated wooden tunnel, it was found entirely feasible to kill practically all codling moth larvae at a cost of $0.75 to $2 per thousand for packing boxes, and at a cost of $1 to $2.67 per thousand for cannery lug boxes.

The large-scale bait-trap experiment conducted at Orleans, Ind., in 1934 indicated that the traps and materials now available will reduce the infestation by about 25 percent. Further studies of the use of baits and bait traps, in the hope of developing sufficiently effective materials and traps for use in direct control, are under way at Vincennes, Ind., and Yakima, Wash. Fundamental studies of the reaction of moths to lights are under way at Geneva, N. Y., in cooperation with the New York Agricultural Experiment Station, and large-scale tests of light traps are being carried on at Orleans, Ind., in cooperation with the Indiana Agricultural Experiment Station.

Further experiments with the control of the codling moth by the use of parasites are under way. The mass liberations of the egg parasite *Trichogramma minutum* Riley, made in 1934 at Yakima, Wash., and Cornelia, Ga., did not result in any appreciable reduction in the codling moth population. The egg-larval parasite *Ascogaster carpocapsae* Vier. has been introduced into a number of western and southwestern localities where it did not previously occur.

At Wooster, Ohio, tests are being conducted to determine the effect of oils, and of insecticidal materials that may be added to them, on hibernating larvae of the codling moth. Certain grades of pine-tar oil used at a strength of 50 percent appear to be effective and are more toxic than are other oils tested.

PEACH INSECTS

The station at Fort Valley, Ga., has continued its efforts to develop a satisfactory substitute for lead arsenate for the control of the plum curculio on peaches. Fluorine compounds tested during the early summer of 1935 caused serious injury to the fruit. This injury, which appeared to an equal extent on trees sprayed with barium fluosilicate, with synthetic cryolite, and with natural cryolite, was sufficiently severe to rule out these materials for use on peach trees.

Further studies of the effect of lime-sulphur, applied during the dormant period for the control of the San Jose scale, have revealed the fact that mortality counts made within a month or two after the spraying are very misleading and that, for full information on the effect of lime-sulphur, it is necessary to delay the examination for 4 or 5 months.

The rearing and liberation of imported parasites of the oriental fruit moth have been continued. Some 216 colonies, chiefly of foreign parasites, containing 45,000 parasites, have been released by the workers of the Moorestown, N. J., laboratory in various peach-producing sections in 13 Eastern and Middle Western States. Recovery collections have indicated that the general level of parasitization is increasing, although there has not yet been time for the general establishment of many of the foreign parasites that have been liberated.

The investigations of baits and bait traps for the control of the oriental fruit moth have been transferred from Cornelia, Ga., to Moorestown, N. J., where much better facilities are available for the work.

GRAPE INSECTS

Numerous possible substitutes for lead arsenate have been tested against the grape berry moth at Sandusky, Ohio. This insect appears to be more readily controlled than the codling moth, and satisfactory control was obtained with nicotine bentonite, nicotine tannate, nicotine sulphate with mineral oil, and mixtures of ground pyrethrum with kaolin. For the most part these mixtures cannot be used in a practical way, however, as they apparently affected the fruit unfavorably. The mixtures which included kaolin and bentonite left very unsightly deposits on the grapes, which, although nonpoisonous, made the fruit practically unsalable. There is a possibility, however, that the use of certain of these clays may prove unobjectionable, or even advantageous, on grapes produced for juice. Mixtures containing oil removed the bloom from the berries, giving them a very unattractive appearance.

Experiments with burning for the control of the grape berry moth during the winter period, carried on in cooperation with the Bureau of Agricultural Engineering, have indicated rather clearly that this practice is not feasible as a means of control. Burning over the margins of vineyards, however, offers considerable promise in reducing the hibernating populations of the grape leaf hoppers (*Erythroneura comes* Say and related species).

NUT INSECTS

Further experiments in the control of the pecan nut case bearer (*Acrobasis caryae* Grote) in the Brownwood, Tex., area have confirmed earlier work, indicating a control of 95 percent or better from two applications of lead arsenate at a strength of 3 pounds per 100 gallons, made in the latter part of May or early in June, during the period of activity of first-brood larvae. A single application gave a control of 75 percent or more. The addition of zinc sulphate or fish oil to the lead arsenate appeared to have comparatively little influence on its effectiveness. Two applications of three-fourths of 1 percent summer oil with nicotine sulphate (1 to 1,000) gave a control of more than 95 percent under Texas conditions, confirming similar results which have been obtained in the vicinity of Albany, Ga. A single application gave results nearly as good. A number of commercial growers in central Texas have been impressed by the results obtained in nut case bearer control and are installing the necessary spray equipment.

The liberations of *Trichogramma minutum* during 1935 for the control of the pecan nut case bearer near Albany, Ga., have resulted in some reduction in infestation in certain orchards; in others the results have been inconclusive, largely because of the lightness of the infestation. Small-scale experiments in 1934 with the use of this parasite for the control of the leaf case bearer (*Acrobasis palliolella* Rag.) gave an apparent reduction of about one-third of the infestation.

Experiments in the control of the obscure scale conducted near Shreveport, La., have indicated further the susceptibility of pecan trees to injury from the use of oil sprays. It appears that the oils should be used with great caution on trees low in vigor.

DRIED-FRUIT INSECTS

At the Fresno, Calif., laboratory studies have been made of devices for reducing infestation in dried raisins by the raisin moth (*Ephestia figulilella* Greg.). It has been found possible to remove a substantial portion of the insects from raisins on ranches by passing the fruit over a specially built shaking and screening device. With certain varieties a reduction of more than 90 percent has been accomplished. With others the results have been less favorable and indicate the need of further adaptation.

In preliminary experiments, a sealing mixture consisting of glucose and gelatin, applied to Adriatic figs by means of a gasoline-powered paint sprayer, has given excellent protection from field infestation by the dried-fruit beetle which infests growing fruit, contributing to the spoilage of figs by various micro-organisms. With Calimyrna figs this practice appears to be of less value, since it is necessary to delay the sealing until the figs have been pollinated by *Blastophaga*.

The workers of the Fresno station have cooperated with representatives of the Bureau of Plant Industry in efforts to develop means of producing endosepsis-free *Blastophaga* in order that these pollinating insects may be introduced into areas in which they are needed, without at the same time introducing endosepsis and other fig diseases.

SUBTROPICAL FRUIT INSECTS

The Orlando, Fla., station has continued its experiments with various adhesives for use with sulphur sprays and dusts for the control of the citrus rust mite. Of the materials tested thus far, preliminary reports indicate the most promise for blood albumen and aluminum sulphate.

The Orlando station has also conducted experiments in cooperation with the Bureaus of Plant Industry and Chemistry and Soils to determine the effect of tartar emetic on citrus trees when applied in small quantities in a sweetened spray mixture. Repeated applications of a drenching spray con-

taining 8 pounds of tartar emetic and 5 gallons of molasses in 100 gallons of spray have caused severe injury. Mist sprays of the same mixtures, on the other hand, have not caused appreciable injury. No effect on fruit composition has been observed thus far. Similar experiments have been conducted in the Rio Grande Valley with the cooperation of the Division of Mexican Fruit Fly Control, with similar results.

Further extensive work is being carried on by the Whittier, Calif., station with the control of the citrus thrips (*Scirtothrips citri* Moulton). A number of materials other than sulphur are being tested this season, including dusts containing rotenone, zinc sulphate, pyrethrum, and zinc oxide. Tests are also under way with bentonite and blood albumen as stickers for sulphur dusts.

The Whittier station has continued to obtain data on the biology of the California red scale as a basis for a study of the resistance of this insect to fumigation with hydrocyanic acid gas.

FRUIT FLIES

Investigations on various fruit flies that are potential pests to fruit culture in the continental United States have been continued at laboratories in Honolulu, Hawaii; Mexico City, Mexico; Mayaguez, Puerto Rico; and Balboa, Canal Zone.

In Honolulu studies to determine the effects of high and low temperatures on the immature stages of the Mediterranean fruit fly in various host fruits have received special attention. Hundreds of thousands of larvae and thousands of infested fruits have been used in these tests. These have centered around the time interval required at 31° to 32° and 108° to 112° F. Laboratory and field studies have also been made to determine the effect a wide variety of poisons may have on adults when used in sweetened sprays. Among the materials tested were various nicotine compounds, copper arsenite, copper tartrate, copper sucrate, and certain salts of cadmium. Some of these are more effective than lead arsenate but none were as toxic as tartar emetic. Experiments to develop and determine the usefulness of different types of traps and baits in controlling and detecting the presence of adults have been continued, special attention being directed to those containing or releasing ammonia.

At Mexico City, attention has been directed principally to baits and poisons for the Mexican fruit fly (*Anastrepha ludens* Loew) and related forms of *Anastrepha*. The studies on baits indicate that a product of the metabolism of yeast or other organisms presents one of the attractive principles. Copper compounds, particularly copper sucrate, have shown a high degree of toxicity, and a special study has been made of them. Attention has also been given to determine the host preference of various fruit flies occurring in Mexico and to experiments to determine the effect of climatic factors, especially low temperatures, on survival. Adults of both *A. ludens* and *A. Serpentina* Wied. survived in outdoor air temperatures as low as 22° F., but both are killed when exposed to temperatures reaching a minimum of 14° for a period of 7½ hours. *A. ludens* appears to be more resistant to low temperatures than does *A. serpentina*.

At Mayaguez, Puerto Rico, the studies have been concerned with *Anastrepha acidusa* Walker and *A. suspensa* Loew and have consisted principally of tests to determine host relations and the effectiveness of various poisons and baits under Puerto Rico conditions.

Twenty-two species of fruit flies are known to occur in the Canal Zone, and work at the Balboa laboratory has been concerned principally with the determination of facts on the habits and host preferences of the various species.

PHONY PEACH DISEASE CONTROL

The phony peach disease, a virus disease intercommunicable among peach, plum, apricot, almond, and several other species, is known to have existed in peach plantings in Georgia for more than 50 years. It was not, however, until about 1920 that serious economic damage occurred. The disease is now recognized as a potential menace to the commercial growing of peaches in this country. The limited amount of scouting from 1926 to 1934 showed that the disease had spread to other States, and it is now known to be wide-spread throughout Georgia, Alabama, Mississippi, Louisiana, eastern Texas, and northern Florida, and scattered in South Carolina, Tennessee, and Arkansas. A few cases have been found in North Carolina, Missouri, and Illinois, and in

1932 one phony tree was found in southern Oklahoma. Since 1929 this Bureau has undertaken the prevention of the spread of the phony peach disease through the movement of nursery stock from infected nurseries. The closely coordinated eradication project that had been carried on by the Bureau of Plant Industry since 1929 was transferred to the Bureau of Entomology in December 1933, and both activities were consolidated the following year into a unified project with field headquarters at the Department's Peach Disease Laboratory, Fort Valley, Ga.

During the period from 1929 to the fiscal year 1935, inclusive, 589,290 trees in commercial and home orchards in 13 States were found infected and destroyed, in addition to eradications under the Civil Works Administration and nursery-inspection work. All the evidence obtained during this period indicates that economic control is practicable under the method employed.

The eradication work in orchards during the fiscal year 1935 is given in table 1.

TABLE 1.—*Commercial orchards and home properties inspected by Federal and State inspectors in cooperation to determine the presence or absence of phony peach disease, fiscal year 1935*

State	Commercial orchards				Home orchards and escaped trees				Total phony trees
	Properties		Trees		Properties		Trees		
	Inspected	Phony	Inspected	Phony	Inspected	Phony	Inspected	Phony	
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
Georgia	945	615	5,017,209	96,954	1,627	533	46,491	2,014	98,968
Alabama	3	2	1,300	2	299	24	9,937	68	70
Arkansas	78	17	371,705	27	6	0	100	0	27
Delaware	51	0	154,305	0	250	0	1,545	0	0
Louisiana	76	51	63,652	2,183	5,210	285	47,265	1,162	3,345
Mississippi	25	9	28,293	395	540	25	4,975	49	444
North Carolina	22	1	80,292	5	1,212	19	11,586	24	29
South Carolina	18	1	38,425	2	133	0	3,233	0	2
Tennessee	32	1	113,525	1	972	10	9,776	25	26
Texas	14	7	23,857	20	25	3	452	6	26
Total	1,264	704	5,892,563	99,589	10,274	899	135,360	3,348	102,937

The data in table 1 show that in commercial orchards 1.69 percent of the trees inspected were found to be infected with the phony peach disease and that in the home orchards 2.47 percent were so infected.

A new plan of action was put into effect at the beginning of the 1935 field season for the purpose of obtaining definite information as to the extent of inspection and the scope of the control problem. For this purpose, four specific lines of activity were determined upon: (1) In the Gulf area where infection is prevalent to the extreme western limitation of peach production, nursery-environs inspection is receiving first consideration as a preventive measure against long-distance spread; (2) inspection and eradication of diseased trees in orchards in this area is also undertaken, the commercial areas receiving principal attention; (3) in the lightly infected States of North Carolina, South Carolina, Tennessee, Arkansas, Oklahoma, Missouri, and Illinois, it is the aim to eradicate all known infected trees, thus preventing, if possible, the northward spread of the disease into new areas; (4) a general survey of peach-growing areas of Delaware, New Jersey, Maryland, Virginia, West Virginia, Kentucky, Ohio, and Indiana is under way to find and destroy any scattered infections that might be present in this region not heretofore known to be infected. This survey will also include those parts of the lightly infected States not now known to be infected with phony peach disease.

During the year assistance was given to States in their efforts to determine the status of the disease in and adjacent to peach-growing nurseries and to develop practicable methods of culling borer-infested and borer-injured trees. The absence of the disease within a 1-mile radius of nurseries, or culling at digging time, is a certification requirement placed by many States in which the peach industry is of economic importance. Federal assistance in this work is

strictly limited to the development of practicable methods and the dissemination of such information. Diseased trees found in the course of inspection are removed by State inspectors and owners. Orchardists also willingly furnished labor for the destruction of infected trees. In the summer of 1934, after the beginning of the fiscal year, 137 nurseries in 10 infected States were inspected, and more than 300 phony trees in the 1-mile zone were found and removed. In the summer of 1935, 30 nurseries had been inspected up to July 1 and 124 infected trees found in the environs and destroyed.

Many peach growers in Georgia recently expressed confidence that the eradication of escaped peach trees conducted by the Civil Works Administration in the winter of 1933–34, in clearing out wild and abandoned peach trees, had done much toward solving the problem of phony peach disease control. Other growers have commented on the noticeable decrease in the number of curculios infesting trees in orchards so protected, as compared with those not protected. A similar project has been approved for the fiscal year 1936, to be carried on emergency relief funds, for the purpose of destroying wild host plants, chiefly escaped peaches and abandoned orchards, thus removing these reservoirs of regional infection that hamper the regular orchard eradication activities.

CITRUS CANKER ERADICATION

The citrus canker eradication campaign is unique in character in that it is the first instance of the use of Federal funds appropriated specifically for the eradication of a plant disease. Despite the skepticism of many specialists who, at the time the work was inaugurated 20 years ago, regarded the effort as foredoomed to failure, the citrus industry has been protected from the ravages of this destructive disease. The effectiveness of this campaign is definitely proved by the fact that although canker was found on 515 properties in Florida, scattered through 26 counties, and approximately 3,000,000 citrus trees were destroyed because of the disease, no citrus canker has been reported since 1927 in this extremely important citrus-producing State.

During the years from 1915 to June 30, 1933, citrus canker eradication activities were maintained cooperatively with the States of Florida, Alabama, Louisiana, Mississippi, and Texas, and Federal supervision was delegated to the Bureau of Plant Industry until December 1, 1933, when it was transferred to the Bureau of Entomology. During 1934 cooperative inspection work was limited to Louisiana and Texas in areas where incipient infections were known to persist.

In the fiscal year 1935 the project was reorganized and a Bureau representative assigned to direct activities in the field in cooperation with the State officers. Such field contact gave impetus to the work from the start. A methodical drive was centered in the Galveston area of Texas to search for infection in wild or abandoned trees in wooded bayous, along roadsides, or in nurseries or home plantings. Due to infections developing in relatively young plantings in this area from time to time it was obvious that somewhere in the vicinity lingered undiscovered infected trees and the task was to find and destroy them. From the beginning of the drive in January 1935 to the close of the fiscal year from 2 to 4 inspectors working this area found citrus canker on 31 properties. All infected trees, totaling 606, and exposed trees, totaling 5,728, were destroyed under State authority. All citrus trees located in the day's work were plotted on a map for use in the event of the approval of more extensive eradication under an emergency relief project. Limited scouting during the year failed to disclose any infection in the commercial area of the lower Rio Grande Valley or the citrus-growing areas of Mississippi and Alabama. In Louisiana citrus canker was found in three parishes during the summer of 1934. The 14 infected trees and 32 other exposed trees were destroyed and, although grove and fruit inspection has been continued in the intervening months, no further infection has been discovered in that State. There were 218,904 trees inspected in Louisiana from July to December 1934. In Texas the inspection of 829,775 trees in 16 counties during the first half of the fiscal year disclosed 20 infected trees on 2 properties in the Galveston area. These were destroyed.

An extremely important and encouraging factor in the campaign is the recent approval of an emergency relief project to destroy abandoned and escaped citrus trees throughout the citrus-producing areas of Louisiana and Texas.

There is every reason to believe that continued systematic scouting in the citrus-producing areas of Texas and other States will ultimately result in complete eradication of citrus canker from the United States.

It will be noted that the figures in table 2 cover only the 6-month period beginning January 1, 1935. The few infected nurseries found in this work consisted chiefly of abandoned plantings, which were destroyed, and there were no indications that infected stock had been shipped from such nurseries.

TABLE 2.—*Citrus canker inspections, January 1 to June 30, 1935*

State	Counties or parishes inspected	Properties		Trees inspected			Trees	
		Inspected	Infected	Grove and dooryard	Abandoned	Nursery stock	Infected	Destroyed
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
Alabama	2	301	0	13,698	66,482	60,672	0	114,800
Louisiana	3	543	0	294,632	0	17,850	0	0
Mississippi	6	952	0	23,987	95,239	13,053	0	0
Texas	9	4,165	31	35,993	126,629	1,136,999	606	6,334
Total	20	5,961	31	368,310	288,350	1,228,574	606	121,134

MEXICAN FRUIT FLY CONTROL

ENLARGEMENT OF REGULATED AREA

On account of finding infested grapefruit near Falfurrias in March 1935, Brooks County, Tex., was added to the regulated area. The order putting this county under the regulations of Quarantine No. 64 was promulgated March 19.

One infested sour orange was also found at Premont, Jim Wells County, about 8 miles north of Falfurrias. In view of the fact that there is practically no fruit in this locality, Jim Wells County was not included in the regulated area.

INFESTATIONS IN TEXAS

ADULTS

By the use of traps in groves and brush, adult *Anastrepha ludens* Loew were trapped during 7 months of the fiscal year 1935. The first fly was taken near San Benito on November 26. In December 11 more were taken in five districts, and in January 142 were submitted for identification from all districts of the regulated area except Mercedes and Raymondville. During February, March, April, and May the number of adults trapped was steadily reduced until June. In that month none was taken. The total for the year was 371 adults taken on 179 premises. The total includes 23 adults trapped in Starr, Webb, and Brooks Counties from 7 premises. The number of adult *A. ludens* taken in the valley proper represents an increase of 69 specimens over the previous year. There was, however, a decrease of 10 premises found infested for 1934–35. Adults were trapped at some time during the year in all districts except Raymondville.

Trapping outside the lower Rio Grande Valley revealed that several species of fruit flies were present in Brooks, Starr, Zapata, and Webb Counties. In these counties, 23 *A. ludens;* 1 *A. serpentina* Wied.; 6 *A.* sp. *Y;* 4 *A. fraterculus* of various authors, and 224 *A. pallens* Coq. were taken in traps. Although only Brooks County has been added to the regulated area, trapping operations were carried on in the other counties named in order to determine whether further enlargement of the regulated area might be necessary.

In the fall of 1933 a severe Gulf storm struck this area. This storm stripped immense quantities of fruit from the trees and in that year the high record for *A. ludens* trapped came in March. This past year the high record came in January and lacked one specimen of equaling the high of the previous March. There were 2 freezes in 1935, 1 on January 21 and the other on February 26. Doubtless these abnormal weather conditions affected the February catch considerably, as the total dropped from 142 for January to 42 for February.

On a basis of each 1,000 trap inspections made, there were 0.48 more *A. ludens* trapped from January through June in 1935 than in the corresponding period of the previous year.

The total number of adults of *Anastrepha ludens* trapped within this period is shown in table 3.

TABLE 3.—*Anastrepha ludens trapped in Texas, fiscal year 1935*

District	Adults	Premises	District	Adults	Premises
Mission	55	33	Harlingen	12	9
McAllen	32	19	San Benito	13	10
Edinburg	16	11	Brownsville	10	9
Pharr-San Juan-Alamo	97	29	Falfurrias	12	1
Donna	54	12	Starr and Webb Counties	11	6
Weslaco	31	21			
Mercedes	6	5	Total	371	179
La Feria	22	14			

LARVAE

Infested fruit was found in six districts from Weslaco westward to Mission. The first larvae were discovered in February and the last were found during the clean-up in April. There were 30 premises involved in larval findings. This number includes 1 premise at Premont, Jim Wells County, and 2 premises near Falfurrias, Brooks County. The detailed larval findings are listed in table 4.

TABLE 4.—*Infestations of Anastrepha ludens in Texas, fiscal year 1935*

District	Larvae taken	Premises	District	Larvae taken	Premises
	Number	*Number*		*Number*	*Number*
Mission	269	10	Weslaco	41	4
McAllen	71	2	Falfurrias and Premont	42	[1] 3
Edinburg	7	2			
Pharr-San Juan-Alamo	300	6	Total	760	30
Donna	30	3			

[1] Infested fruit found in packing house at Falfurrias traced to 1 premise. This included in 3 infestations in Falfurrias and Premont district.

OTHER FRUIT FLIES

By the use of traps the occurrence of nine other trypetids aside from *Anastrepha ludens* has been disclosed. Of these *A. pallens* occurs in largest number and is known to confine its attack to fruits of certain noneconomic native shrubs. A few specimens of the papaya fruit fly *Toxotrypana curvicauda* Gerst. have been captured, but the species has no economic significance under valley conditions. The other 7 species have not been found infesting fruit and comparatively little is known of their habits; 4 of them represent undescribed species. Of the better known species, *A. serpentina* was taken 96 times in traps rather generally over the entire area; 179 specimens of *A. fraterculus* were taken, also generally distributed; and 4 adults of *A. striata* were taken from Edinburg, Mission, and McAllen districts.

COLLECTIONS OF SPECIMENS

During the year 30,790 specimens were submitted to the Harlingen, Tex., laboratory for identification. This total includes all the specimens sent in by inspectors, both in Texas and Mexico, but does not include many larvae collected in Matamoros and turned over to the Mexican inspector for rearing purposes and transmittal to Mexico City.

GENERAL INSPECTIONS

Part of the general duties of the inspection force is grove inspection for infested fruit and unsanitary conditions in the groves; tree-to-tree inspection on final clean-up; trap operations, and removal of alternate host-fruit trees and fruit. This work is carried on throughout the year. During the past year 37,907 grove inspections were made. Traps were examined 331,635 times on 3,474 premises, and 104 alternate host-fruit trees were destroyed on 35 properties with the consent of the owners.

INSPECTIONS IN MEXICO

Since the inception of this project, it has been deemed advisable to keep an inspector at Matamoros for the purpose of trapping, spraying, and collecting infested fruit. There has recently been added one part-time inspector at Reynosa. It is believed that much of the danger of reinfestation from Mexico is reduced by collecting infested fruit before it is sold and before the larvae are widely scattered along the border.

These inspectors trapped in these two border cities and adjacent wild growth, 68 *Anastrepha ludens*, 1 *A. fraterculus*, 7 *A.* sp. *Y*, 2 *A. striata* Schin., 14 *A. pallens*, 1 *A. serpentina*, and 1 *Anastrepha* sp., probably new. They also collected from market fruit 21,637 *A. ludens* larvae, 135 *A. striata*, 57 *A. serpentina*, 73 *A. fraterculus*, 1,028 *Anastrepha* sp. probably *A. acidusa* Walk., and 179 *Rhagoletis* sp. The total of all specimens submitted was 23,109.

It is granted that all infested fruit on the markets is not found but, by intensive trapping and spraying where adults are found, no larval infestations have been located during the past year in locally grown fruit.

Table 5 gives in detail the results of inspec ion in Matamoros, Reynosa, and adjacent wild growth.

TABLE 5.—*Infestations of Anastrepha spp. and other Trypetidae in Mexican border cities and adjacent wild growth, fiscal year 1935*

Month	Adults trapped								Larvae and pupae found in market fruit						
	A. ludens	*A. fraterculus*	*A.* sp. *Y*	*A. striata*	*A.* sp., probably new species	*A. pallens*	*A. serpentina*	Total	*A. ludens*	*A.* sp. not *ludens*	*A. striata*	*A. serpentina*	*A. fraterculus*	*Rhagoletis* sp.	Total
July	18	----	----	----	----	----	----	18	11,340	-------	-----	27	42	-----	11,409
August	9	----	----	----	----	----	----	9	73	-------	-----	12	27	1	113
September	4	----	----	----	1	----	----	5	47	-------	12	18	1	2	80
October	----	----	----	----	----	----	----	0	84	-------	13	----	2	66	165
November	6	----	----	1	----	----	----	7	1,091	-------	9	----	1	110	1,211
December	6	----	----	----	----	----	----	6	88	-------	14	----	----	-----	102
January	11	1	----	1	----	----	----	13	307	-------	86	----	----	-----	393
February	----	----	----	----	----	3	----	3	3,047	-------	1	----	----	-----	3,048
March	----	----	4	----	----	9	----	13	3,504	-------	-----	----	----	-----	3,504
April	3	----	2	----	----	----	----	5	682	3	-----	----	----	-----	685
May	6	----	1	----	----	2	----	9	1,037	77	-----	----	----	-----	1,114
June	5	----	----	----	----	----	1	6	337	948	-----	----	----	-----	1,285
Total	68	1	7	2	1	14	1	94	21,637	1,028	135	57	73	179	23,109

SPRAYING OPERATIONS IN TEXAS

When an adult *A. ludens* was trapped or larvae were found, the grove in question was sprayed with a nicotine sulphate-molasses spray. During the past year, from December through April, the trees on 232 premises were given at least one complete coverage with this spray and in some instances certain groves were sprayed twice. There were 92,613 trees sprayed.

Table 6 embodies this complete record for the year, with comparative figures for 1933–34.

TABLE 6.—*Summary of spraying operations in Texas, fiscal year 1935*

Month	Trees sprayed	Premises sprayed	Material used	
			Nicotine	Molasses
	Number	*Number*	*Gallons*	*Gallons*
December	2,071	5	11	220
January	14,274	31	66.75	1,335
February	8,255	23	27.50	550
March	33,270	98	100.4	2,000.5
April	24,743	75	107.84	2,157.5
Total	82,613	232	313.49	6,263
Total for 1933–34	95,657	243	419	8,581

SHIPMENT OF FRUIT

The shipping season of 1934–35 opened on September 26 and the harvesting season closed April 2. The last fruit to leave the valley was permitted out in May. This was from cold-storage plants. Railroad reports for the season show 4,572 solid carloads of fruit and 38 carloads of mixed fruit and vegetables leaving the valley. These rail shipments show on our records as 4,670 equivalent car lots. The base used in computing equivalent car lots was 372 boxes, 575 bushels, or 30,600 pounds in sacks. The increase in equivalent car lots over actual carloads was due in large part to the fact that fruit shipments in sacks averaged considerably higher than 30,600 pounds to the carload. A total of 17,699 permits for shipment of fruit by truck were issued during the season, or 2,801 equivalent car lots. Shipments by express are estimated at 100 equivalent car lots. This makes a grand total for the season of 7,571 equivalent car lots.

During the shipping season of 1934–35 the new 100-pound box was introduced to the trade, 5 carloads of fruit being packed in such containers. A new bushel box was also used to a small extent. The 10-pound sack was popular during the holiday period, 15,644 of such containers being used. The use of sacks for containers increased greatly during the season, 15 percent of the crop being moved in such containers, as compared to 0.5 percent the previous season. Of the total fruit shipped, oranges constituted 17 percent.

ROAD TRAFFIC INSPECTION

In order to enforce quarantine regulations, it is essential that motor vehicles be inspected when leaving the area. A road station is located on the main highway at the Brooks County line and this station passed 11,631 trucks from November to March, inclusive. These trucks carried 2,283.6 equivalent car lots of fruit. The average trucker is well aware of the regulations and, as a result, only 9 trucks were turned back on account of not having correct permits. Details of road-traffic inspection will be found in table 7; however, as the road station was open only from November through March, not all details of fruit movement by motor vehicles for the entire season are shown in this table.

TABLE 7.—*Road-traffic inspection, fiscal year 1935*

Month	Trucks inspected		Fruit passed, packed in boxes and baskets					
	Passed	Not passed	Grapefruit		Oranges		Total	
	Number	*Number*	*Boxes*	*Bushels*	*Boxes*	*Bushels*	*Boxes*	*Bushels*
November	1,534	1	19,731	63,111	7,678	62,153	27,409	125,264
December	2,569	6	20,781	93,484	7,711	130,616	28,492	224,100
January	2,676	0	21,550	116,955	5,736	122,348	27,286	239,303
February	2,851	1	18,204	140,218	8,868	122,613	27,072	262,831
March	1,991	1	26,481	130,149	1,627	35,509	28,108	165,658
Total	11,621	9	106,747	543,917	31,620	473,239	138,367	1,017,156

Month	Fruit passed in sacks				Fruit confiscated
	Grapefruit	Oranges	Total		
	Number	*Number*	*Sacks*	*Pounds*	*Packages*
November	[1] 1,360	[1] 1,361	2,721	137,875	42
December	[1] 4,667	[1] 5,000	9,667	655,340	42
January	11,471	3,479	14,950	1,192,360	18
February	23,252	4,937	28,189	2,255,120	0
March	14,858	424	15,282	122,670	0
Total	55,608	15,201	70,809	4,363,365	102

[1] The total amount of fruit in sacks passed is correct. The kind of fruit in sacks was estimated for November and December.

MISCELLANEOUS

CANNING PLANTS

Eleven citrus-canning plants were in operation during part of the shipping season of 1934–35. These plants used 16,292 tons of grapefruit, most of it being juiced. This tonnage roughly equals 1,085 cars.

EXPERIMENTAL SPRAYING

This project carried on spraying experiments this season in cooperation with the Bureau of Chemistry and Soils and the Bureau of Plant Industry. The purpose of these experiments was to determine what effect, if any, tartar emetic had on citrus trees and fruit. It is planned to continue these experiments through the coming season.

WILD-HOST STUDIES

As several species of fruit flies are frequently taken in traps in the valley, it is thought that these flies are breeding in various local hosts. A study of the flora of the valley is, therefore, being made and collections of fruits and plants are sent in to the laboratory daily. Examination in the field is also being made. With the exception of one collection of *Anastrepha* sp. larvae, reported as coming from the fruits of cactus, these studies have all given negative results.

WEST INDIAN FRUIT FLY AT KEY WEST, FLA.

Cooperation has been continued with the State Plant Board of Florida in its effort to eradicate two forms of the West Indian fruit fly from the island of Key West. As an aid in carrying on this work, an allotment of $36,000 was made available by the Public Works Administration, and the spraying, trapping, inspection, and fruit-removal work was materially increased. Some 2,000 traps were used to detect the possible presence of the adult flies, thus greatly intensifying the inspection. Fewer adults were collected than during the past year, and no immature stages of either *Anastrepha acidusa* Walker or *A. suspensa* Loew were found during the 10 months ended June 30, indicating that definite progress has been made in reducing the numbers of these insects.

DATE SCALE ERADICATION

Inspection was continued over a smaller area during the year, a considerable acreage having been dropped as free from scale during the fiscal year 1934. Further reduction in acreage was made in the eradication area during the present fiscal year. Clean-up work was completed in Arizona. No *Parlatoria* scale was found during the year.

COACHELLA VALLEY

During the year, 6,167 palm inspections were made from ground and ladders; 25,750 were made from the ground only; and 6,967 offshoots were certified for movement. Leaf bases were removed from 29 previously infested palms; 6 previously infested palms and 4 adjacent ones were dug out and destroyed; and 2,343 palms in or near previously infested plantings were pruned to facilitate inspection. No *Parlatoria* scale has been found in the Coachella Valley since November 1931.

IMPERIAL VALLEY

In the Imperial Valley 4,478 palm inspections from ground and ladders and 14,545 from the ground only were made, and 356 offshoots were certified for movement. Leaf bases were removed from 24 previously infested palms; 2 valueless palms were dug out and destroyed and 77 were pruned to facilitate inspection. No infested palm was found during the year, as compared with 11 found on 1 property during the fiscal year 1934, and 7 on 4 properties in 1933.

PHOENIX DISTRICT

In the Salt River Valley of Arizona and other localities in Arizona 12 palms were inspected from ground and ladders and 2,617 from the ground only. Four

sections were scouted for unlisted palms and 307 properties checked for volunteers. This concludes the eradication work in the Phoenix district, except for the final inspection of a few plantings of offshoots from previously infested properties in the Coachella Valley and the Imperial Valley.

YUMA DISTRICT

In the Yuma district 530 palms were inspected from ground and ladders and 16,173 from the ground only, and 139 offshoots were certified for movement. Leaf bases were removed from 97 previously infested palms, 643 palms in the infested area were dug out and destroyed, 239 palms were pruned and offshoots destroyed, and 14 were pruned. No scale was found. This concludes the eradication work in the Yuma district, except for ladder inspection on 3 properties.

A summary of date scale activities is given in table 8.

TABLE 8.—*Summary of date-scale activities, fiscal year 1935*

Item	Arizona		California		Total
	Yuma district	Phoenix district	Coachella Valley district	Imperial Valley district	
Palms inspected from ground and ladders	530	12	6,167	4,478	11,187
Palms inspected from ground only	16,173	2,617	25,750	14,545	59,085
Offshoots inspected for movement	139	0	6,967	356	7,462
Palms pruned to facilitate inspection	14	0	2,343	77	2,434
Palms pruned and offshoots destroyed	239	0	0	0	239
Palms leaf-base inspected	97	0	29	24	150
Palms dug out and destroyed	643	0	10	2	655
Sections scouted for unlisted palms	0	4	0	0	4
Properties checked for volunteers	0	307	0	0	307
Palms checked to determine clean-up necessary	4,934	0	0	0	4,934

JAPANESE AND ASIATIC BEETLE INVESTIGATIONS

JAPANESE BEETLE

The area continuously infested by the Japanese beetle in 1934 was estimated at 9,700 square miles, in the States of New Jersey, New York, Pennsylvania, Delaware, and Maryland. This is an increase of 900 square miles over 1933. No appreciable increase in the beetle population was found in the older infested area of New Jersey. The infestation has definitely increased in the more recently infested counties in southern New Jersey and in nearly all of the infested sections of Pennsylvania, Delaware, and Maryland. A source of public complaint has been the number of beetles, dead and alive, washed up on the shores of bathing beaches. A combination of favorable winds and high temperatures at the time of maximum beetle flights resulted in enormous swarms of beetles being carried over the Delaware River and the Atlantic Ocean. This situation has been particularly annoying along the New Jersey and Long Island coast beaches.

It has been found that larval populations develop faster in sod fields than in cultivated fields. The average density of the larval population in the heavily infested districts ranged from 13.7 in pastures to 2.3 per square foot in pumpkin fields. It is evident that the population is higher in fields planted to crops, such as corn and asparagus, on which beetles feed readily, than in fields of tomatoes, potatoes, and pumpkins, which are only occasionally attacked.

During the past two winters unusually low temperatures and heavy snows occurred in the area of general infestation. Owing to the presence of a heavy covering of snow, the soil temperature was only slightly influenced by the cold, and there is no evidence that there was any marked general reduction of the larval population.

Bacterial diseases, particularly the "milky" disease which appears to develop at a temperature above 60° F., caused a noticeable reduction in the larval population during the spring of 1935; in limited areas in some localities about one-fifth of the larvae were affected. The occurrence of disease is, however, localized and subject to considerable fluctuation due to variable soil conditions.

Comparative tests were conducted under controlled conditions with many materials as substitutes for lead arsenate in soil for the control of the larvae. Some of these materials were equally as effective in destroying the insect but are either costly or injurious to plants. It was found that the effectiveness of acid lead arsenate in killing the larvae is modified by the type of soil. This difference was not correlated with the total salts present or the pH of the soil. The amounts of soluble ammonia, phosphorus, and magnesium were the most important factors influencing the insecticidal action under favorable conditions, the effectiveness being increased in soils containing high concentrations of water-soluble ammonia or phosphates and decreased with the increase of soluble magnesium salts in the soil.

The adult beetle causes considerable damage to roses in commercial greenhouses by emerging during the winter months and feeding on blooms. Tests during the season indicate that this damage can be prevented without injury to the plants by treating the beds with lead arsenate. Preliminary data indicate that ortho-chloro-phenol, cresol, limpid oil, and carbasota may be of considerable value as repellents for the Japanese beetle and thus afford protection to flowering shrubs in home gardens against injury by the beetle.

In further study of the geraniol bait as an attractant for the Japanese beetle, it was found that none of the constituents of geraniol is more than 60 percent as attractive as the recommended combination of geraniol and eugenol. Phenyl ethyl alcohol added to the standard bait increased the attraction, but the increase in the cost of the bait for a comparatively small gain in the number of beetles caught does not appear to be warranted under general conditions. These studies have made it possible to prepare and recommend specifications for a cheaper grade of geraniol for use in attracting the Japanese beetle. It has been definitely established that traps painted green and white are superior to traps painted with other colors. Public-service patents covering two types of Japanese beetle traps have been granted to F. W. Metzger.

Derris is a weak stomach poison but has a definite repellency for the adult Japanese beetle, the repellent action appearing to be due to the rotenone and deguelin content. Exposure to light decreased the effectiveness of derris and the material was readily washed from foliage by rain. Several materials have been tested as stickers and as means to prevent the decomposition of derris in the field. Oils, while very effective stickers, have been found to accelerate the decomposition of derris when spread in a thin layer on the surface of the leaf. The emulsified residue from rosin stills has been found to be the cheapest and most effective sticker that does not accelerate the decomposition. The addition of magnesium silicate to the spray increased the period that the material is effective as a repellent. Derris without a sticker appeared to be of little value in the protection of early ripening apples from attack by the beetle. Derris with the sticker has given promising results. The derris spray has a disadvantage in that it is necessary to repeat the application every week to maintain good control.

It has been known for several years that the application of hydrated lime afforded considerable protection to foliage from injury by the beetle, but the material was limited in its usefulness on account of its poor adhesiveness. The addition of aluminum sulphate to the lime spray produced a residue on the foliage which lasted through the summer. The use of this cheap, nontoxic repellent spray offers considerable promise in commercial orchards and on ornamental trees and shrubs.

Investigation to develop methods for treating agricultural commodities to prevent artificial dispersion of the insect by human agencies suggests that fumigation with hydrocyanic acid, carbon disulphide, or ethylene oxide, now used for the treatment of small fruits and bananas, might be extended to include potatoes, onions, cabbage, peaches, apples, and certain other farm products. The lead arsenate treatment of nursery stock in the field has been very satisfactory and has made it possible to eliminate grubs in the soil about the roots of large quantities of stock. The major weakness of the treatment is in the lack of a uniform distribution in the commercial nurseries. In tests, uniform distribution was obtained by applying lead arsenate over the whole area of ground on which plants were standing and working it into the soil. The application of the lead arsenate only to the area between rows of plants did not, however, result in a uniform distribution. Encouraging results have been obtained with paradichlorobenzene for the treatment of certain varieties of azaleas and potted plants to destroy larvae in the pots.

Considerable progress has been made in the colonization of imported parasites of the Japanese beetle at a number of points in the generally infested area. *Tiphia vernalis* Roh. is now well established and increasing rapidly. In the spring of 1935, 141 colonies were placed in heavily infested areas in New Jersey, Pennsylvania, and Delaware, making a total of 493 colonies of this species in the field. *T. popilliavora* Roh. was definitely established in 1926 and has been extensively colonized; 185 colonies were placed in the field during this summer, bringing the total number of colonies to 379. This species shows more fluctuation in population from year to year than *T. vernalis*. Two colonies of the Korean strain of *T. popilliavora*, which appears in the field later than the Japanese type and is more nearly synchronized with the appearance of the third-instar larvae, were placed in the field, and sufficient material is available to place approximately 20 colonies of this parasite in the field during the coming year.

THE ASIATIC BEETLES

The Asiatic garden beetle (*Autoserica castanea* Arrow) has continued to spread westward on Long Island and in Westchester County, N. Y., in suburban areas immediately adjacent to Philadelphia, Pa., and throughout New Jersey. The injury caused by the grubs to vegetable seedlings was marked late in the spring and early in the summer. A large number of complaints were received from restaurants, drug stores, and baseball parks and other places of amusement which operate at night and use large flood lights, because the beetles were attracted to the lights in such enormous numbers that they became a nuisance and curtailed business activities.

It has been found that rose geranium oil, eugenol, and tansy oil are definitely attractive to this beetle, indicating the possibilities of using these materials to increase the capture of the beetles in the light traps. Two types of traps and lights were tested, and on favorable nights as many as 2,000 beetles per trap were captured in a single hour. Tests during the summer indicate that this beetle can be controlled in vegetable gardens by the use of a poisoned bait containing bran, lead arsenate, molasses, and water.

Tiphia asericae A. and J., a Chosenese parasite of the Asiatic garden beetle, which was liberated in previous years in the vicinity of Philadelphia, in northern New Jersey, and on Long Island, has been recovered in these localities.

The status of the oriental beetle (*Anomala orientalis* Waterh.) is about the same as in 1934, the spread of this species being relatively slight. Some injury has been observed in lawns and gardens but much less than is caused by the Asiatic garden beetle.

JAPANESE BEETLE QUARANTINE AND CONTROL

EXTENT OF INFESTATION

For the first year since the original quarantine on account of the Japanese beetle was issued in 1919 it was not considered necessary to extend the territory under regulation. Only three first-record finds of major importance—at St. Louis, Mo., Chicago, Ill., and Indianapolis, Ind.—were recorded during the 1934 trapping season. The most outstanding find at a point remote from the central infested area was that disclosed at St. Louis, where beetles were collected in such numbers as to indicate an established infestation. At Indianapolis 17 beetles were caught in a residential section at some distance from a railroad line. This infestation probably resulted from illegal transportation of infested plant material. The locations at which were trapped 6 beetles in Chicago and 1 beetle in East St. Louis, Ill., point to the probability that these adults had been transported by rail from the heavily infested sections of New Jersey or Pennsylvania.

With limited funds available for determining the spread of the insect, trapping was confined to those States immediately adjacent to known infested territory. Supplementing trap surveys in nonregulated territory in Maine, New York, Pennsylvania, Ohio, West Virginia, Virginia, and Maryland, traps were operated to check previously determined infestations in Detroit, Mich., St. Louis, Mo., and Greenville, S. C., and to determine presence of the insect in Chicago and East St. Louis, Ill., and a few selected cities in Indiana. The season's trapping program began in Virginia on June 18. Trap distribution progressed northward following the dates of probable beetle emergence. The latest traps set were those placed in Maine. Except in cities where continued

catches were being made, most of the traps were lifted after a 30-day period of operation. Final lifting of the late-operated traps in Maine was accomplished by September 21. Prior to use, these traps were reconditioned and coated with aluminum paint. As this protective coating weathered much better than the previously used combination of green and white enamel, the traps, after being lifted for the season, were stored in municipally owned and county-owned buildings, from which they may be readily distributed to adjacent territory next season. Curtailment of funds allowed the operation of only 31,000 of the project's supply of 56,000 traps.

In addition to the important first-record finds disclosed, beetles were caught in 5 cities in Maine; 58 Maryland communities both inside and outside the regulated zone; in Detroit, Mich., where a few beetles have been trapped each year since 1932; in 9 New York cities; in 6 Ohio localities; in Erie, Pa., where an infestation first was disclosed in 1931; in 6 cities in Virginia; and at 7 points in West Virginia. Traps set in Greenville, S. C., in an effort to pick up additional beetles at the site where two beetles were collected by hand, failed to catch any further specimens. Practically all of the few first-record infestations found in these States consisted of a few beetles each. None of these findings clearly pointed to an established infestation.

The setting of traps in St. Louis for the 1935 season began on May 10 from a supply of 10,463 new standard traps shipped directly to St. Louis from the manufacturer in Philadelphia. By the end of the fiscal year, 5,915 of these were in operation, and a total of 38 beetles had been caught. Owing possibly to later emergence, this was a considerable reduction over the 1934 figures on the same date. At that time only 820 traps had been in place for a period of 11 days or less, and 513 beetles had been captured. The fall application of lead arsenate to the infested sections, although less effective than it would have been had the ground been poisoned before the eggs hatched, may have aided in preventing any great increase in the larval population.

Southern trapping was under way at the end of the fiscal year in North Carolina, South Carolina, and Virginia, the only Southern States in which traps were used in 1935. Traps were used in 33 localities in North Carolina, 23 in South Carolina, and 33 in Virginia. Trap tenders in these States were supplied from relief rolls under projects approved at the request of the State entomologists of the respective States. A few beetles each had been trapped at Charlotte, Durham, Elizabeth City, Goldsboro, Greensboro, Lumberton, Raleigh, Rocky Mount, Salisbury, Sanford, and Statesville, N. C., and Ashland, Culpeper, Emporia, Hopewell, Petersburg, Sandton, Westhampton, Dunreath, and Westover Hills, Va. Trap captures in larger numbers had been made in Spencer and Winston-Salem, N. C., and Greenville, S. C., where catches had been made in previous seasons. Most of the traps used in these Southern States were drawn from a supply of 20,000 collapsible tin-plate traps die stamped and assembled at the New Cumberland, Pa., warehouse.

Peak emergence of the adult beetle during 1934 was from 10 days to 2 weeks in advance of the usual date for maximum emergence. By July 4, in densely infested sections of southern New Jersey, beetles had balled on early apples, and browning of foliage on badly devoured trees was plainly evident from a distance. By July 10 the foliage of many trees was completely skeletonized in the Shiloh section. Beetle activity reached its peak by the middle of July. Beetles were present in greater numbers than ever in Wilmington, Del. Cut flowers presented for inspection at the wholesale houses in Philadelphia showed evidences of beetle feeding. Frequently consignments of spirea from New Jersey were badly eaten by the insect.

Although the Bureau made no attempt to survey the damage caused by the insect during the summer of 1934, a rather comprehensive survey of Japanese beetle damage was made during the year in Cumberland County, N. J., under the auspices of the Emergency Relief Administration of the State. Investigators working on the survey canvassed 4,047 individuals (farmers and also property owners in towns and cities) representatively scattered throughout the county. Definite reports of beetle depredations were received from 2,570 of those interviewed, and 761 individuals stated their losses in terms of crop percentages. Only 715 reported no injury. Total damage of $166,646 on 42,004 acres was reported in the 2,570 definite returns. This involved an average damage of $3.97 per acre. This sum was also used in arriving at a total damage of $102,017 on the 25,697 acres covered by the 761 reports expressed in crop percentages. The 716 individuals reporting freedom from injury operated an additional 9,910 acres. In total, the survey disclosed an estimated loss

of $268,663 on 77,611 acres, or an average per acre damage of $3.46. There are in Cumberland County 330,080 acres, 51,087 of which are in marsh land. As the county is primarily agricultural, there are in it approximately 278,993 tillable acres. Figured at the average damage per acre, county-wide damage of $965,316 is estimated. Irrespective of possible factors that might reduce this estimate, it is apparent that Japanese beetle damage is an important factor in the cost of producing farm commodities in this southern New Jersey county. From an analysis of the collected data, it is the conclusion of the Cumberland County planning engineer that concentration of the infestation in the vicinity of Shiloh is due chiefly to the inability of the beetles to cross Delaware Bay, thus resulting in a piling up of the insect in that section. A similar survey was made as an Emergency Relief Administration project in the adjoining county of Gloucester, but data collected were not made available to the Bureau.

In heavily infested agricultural sections in southern New Jersey, sections that for years have been subject to intensive beetle damage are still holding their maximum populations. For 3 consecutive years early maturing apples in certain orchards have been rendered unsalable by beetle feeding. In the Philadelphia water-front district the heavy flight of the adult expected in 1933 did not occur. In the summer of 1934 the insect resumed its heavy flight in the wharf and market districts, contradicting previous indications that the population might have decreased permanently. The adult flight in Philadelphia lasted for nearly 5 weeks, from July 11 to August 13.

Beetle feeding in one block of 1,200 Yellow Transparent apples located in southern New Jersey was responsible for almost complete destruction of the crop. In 1933, 3,600 bushels were harvested from the orchard. Only 36 bushels could be picked in 1934. Other severe commercial damage was evident throughout the densely infested sections.

Flotations of adult beetles in Delaware Bay, Raritan Bay, and the Atlantic Ocean were again observed, but not to the same extent as in 1933. The flotation from New Jersey to the Delaware shore on Delaware Bay was most pronounced in mid-July. Beetles were washed up on the beaches of Long Island on August 10.

Although Waterville, Maine, was included within the regulated zone as an extension of territory resulting from the spread determined in 1933, trapping was repeated there again in 1934 to learn whether the record-breaking subzero weather between the two seasons had killed off the overwintering grub population. Instead of 204 traps being operated for 30 days, as in 1933, this year 300 traps were set for 40 days; and, whereas last year 139 beetles were trapped, this year's capture increased to 299. Apparently the soil temperature at a depth of 6 inches or more did not decline sufficiently to affect larval survival.

SUPPRESSIVE MEASURES

Another progressive reduction in the number of beetles captured in Erie, Pa., was recorded as a result of trapping in that city. A total of 1,427 traps was in operation from July 6 to September 8. This was the largest concentration of traps ever set in the city. Successive years' captures in Erie have been: 1931, 171; 1932, 282; 1933, 167; and 1934, 114. Of the 1934 total, 43 specimens were survivors of infestations discovered in 1933 and first treated in the fall of that year. Most of the remainder represents spread not previously determined. The significant feature of the control work in Erie is that intensive trapping in the older infested section of over 44 acres, where the soil has been poisoned for a period of 2 or more years, disclosed only 3 beetles emerging from the entire area. Continuing the intensive eradication measures of previous years in Erie, the sections surrounding infestations found during 1934 in unpoisoned areas were treated with lead arsenate at the rate of 1,000 pounds per acre. This treatment, involving the application of the soil insecticide to 6.6 acres, was accomplished between September 10 and 17, immediately following lifting of the traps for the season.

Approximately 2,600 traps were set from June 19 to August 25, 1934, in the sections of St. Louis, Mo., believed most likely to be infested, with the resulting capture of 1,351 beetles. Funds were made available by Executive order that enabled the Bureau to apply lead arsenate to all sections of the city where beetles had been caught. Work was begun on September 26 and concluded on November 3. In all, 220 tons of lead arsenate were applied to 440 acres comprising the soil area in 117 infested city blocks. This is the largest control program ever

undertaken at an isolated infestation. Laborers to assist in applying the poison spray were supplied by the local relief administration. The city fire department loaned hose lines. State and city officials accorded excellent cooperation in facilitating the work. Results of scouting of nurseries and greenhouses within a 10-mile radius of St. Louis were negative. A State quarantine on the movement of host material from infested sections is now enforced.

As soon as applications of lead arsenate were completed in St. Louis, the spray equipment was transferred to Indianapolis, Ind., where 38.6 acres were treated at the rate of 1,000 pounds of the soil insecticide per acre. These operations extended from November 7 to 17.

Five tons of lead arsenate were applied between December 3 and 7 to the premises in Charlottesville, Va., on which 60 Japanese beetles were trapped during the summer of 1934. The treated sections comprise 10 acres in a residential section near the Chesapeake & Ohio Railroad freight yards and the Pullman cleaning yards. Arrangements were made by the city manager of Charlottesville for relief labor and the use of necessary city equipment to augment two Federally owned spray outfits.

Trapping by the park department of the city of Springfield, Mass., resulted in the capture of 45,000 beetles. In 1933, 36,000 beetles were caught in the same area. One encouraging feature of the control work is that very few beetles were caught in traps placed in the sections which several years ago received lead arsenate treatments. In West Springfield, where some 5,000 beetles were trapped in 1933, the traps collected only approximately 2,000 beetles. As was the case in Springfield, practically no beetles were caught in traps operated in blocks previously poisoned.

HIGHWAY INSPECTION SERVICE

Vehicular-inspection stations at the border of the regulated territory were already in operation on July 1 at 20 locations. Seven posts were located on the southern border of the Virginia regulated section, two on the Maryland-West Virginia State line, one in West Virginia, seven on the Pennsylvania-West Virginia and Pennsylvania-Ohio State lines, and three in Pennsylvania to cover the highways leading from the regulated area of that State. In addition, three inspectors furnished with cars alternated between seven less important highway stations in the latter State. The highway inspection force numbered 32 men. Closing of these road stations began on October 9. All stations on the border of or within Pennsylvania were discontinued by November 2. The single station maintained near Keyser, W. Va., was closed on October 15. Five of the nine stations inspecting southbound traffic were closed just prior to or shortly after Armistice Day. Continued southern movement of holiday plant material justified operation until November 10 of the stations on United States Highways Nos. 1 and 17 south of Fredericksburg, Va. Posts on United States Routes Nos. 50 and 211, west of Fairfax, Va., continued to inspect southbound traffic until December 22 and 23, respectively. The final interception of infested contraband during 1934 was made on November 1.

Late in March 1935 the four Virginia stations that were last to close in 1934 were reopened. Resumption of activities at 14 other established posts in Virginia and on the State lines northward quickly followed, with the northernmost Pennsylvania-Ohio State line post opening on April 19. These included a new Virginia post on State route no. 7. Guarding of the roads leading intrastate from the Pennsylvania regulated territory began on April 29. Pennsylvania inspectors were assigned by May 10 to the last of 11 stations to be operated during the season. An additional post was involved in the 1935 Pennsylvania intrastate set-up. Engaged in this work at the end of the fiscal year were 29 Federal and 4 Pennsylvania inspectors.

Interceptions were made at the road posts of 98 lots of plant material or other products containing Japanese beetle infestation. From these contraband products there were removed 184 larvae and 76 adults. This is a considerable increase over the preceding year, when 112 larvae of the insect were collected. The largest number of interceptions of infested material was made at the inspection station located just south of Fredericksburg, Va., on United States Route No. 1. Other stations at which numerous lots of infested products were caught were located on United States Routes Nos. 50 and 211, west of Fairfax, Va., and on United States Highway No. 40, west of West Alexander, Pa. Many important interceptions were made. Among them 16 Japanese beetle larvae were removed from 50 potted plants en route from Wawa, Pa., to Lower

Salem, Ohio. Examination of soil accompanying a single flowering plant being moved from Philadelphia, Pa., to Inkster, Mich., resulted in collection of 12 larvae. From numerous larvae taken from soil about the roots of 2 zinnias, 9 pansy plants, and 1 ivy plant being transported from Westtown, Pa., to Chautauqua, N. Y., there were identified 9 Japanese beetle grubs. Nine larvae were taken from soil about the roots of two evergreens found in the possession of a motorist traveling from Woodstown, N. J., o Carmel, Ind. One of the summer interceptions consisted of nine adults taken from the cab of a truck en route from Lime Rock, Pa., to Woodstock, Va. All suspected larvae intercepted by road patrolmen are forwarded to field headquarters for identification.

Among nursery stock surrendered at the road stations were 130 lots of five-leafed pines seized while being transported in violation of Quarantine No. 63.

Inspection of small lots of plants and farm products by road inspectors was continued. The practice of removing uncertified soil and replacing it with fumigated soil on hand at the posts has met with very favorable public response and has materially reduced the frequent complaints that formerly were received from drivers who were obliged to surrender their products or return to a designated center for inspection and certification.

Motor vehicles stopped for inspection at the road stations during the year numbered 2,455,072. Of the cars and trucks examined, 16,695 were found to be transporting uninspected quarantined products.

CERTIFICATION AND TREATMENT OF NURSERY STOCK

Nursery and greenhouse scouting in the summer of 1934 resulted in the finding of adult beetles on a larger number of theretofore uninfested premises than were determined as infested in 1933. Infestations were found for the first time on 64 classified establishments, as compared with first-record finds on 33 such premises the preceding summer. Beetles have been found on the premises of 80 percent of the 363 classified establishments in New Jersey. This condition is largely a result of natural spread of the insect. Among 2,241 nurseries and greenhouses fulfilling the quarantine requirements for classification, 555 are infested and the owners are obliged to grow their stock in screened greenhouses, free it from soil, or chemically treat it before shipping to noninfested territory. This is a net decrease of 135 in the number of establishments on the classified list. There was a large reduction in infested classified establishments, many of which relinquished their classified status rather than conform to the conditions necessary for keeping their stock free from beetle infestation.

Spring demands for inspection and certification of nursery stock were consistently heavy in all States under regulation. A number of shippers that had been inactive for the past 3 years suddenly began shipping, with a consequent need for detailed examination of plant material from an unexpected source. This required that additional inspectors be hired to supplement the regular inspection force.

Soil samples collected from nursery plots treated with lead arsenate were submitted to the Japanese beetle research laboratory for analyses. For the purpose of determining the present toxicity of poisoned nursery plots, 873 samples were collected during April and the early part of May. Results of the analyses were available in time to permit nurseries to restore their treated sections to the required dosage of 1,500 pounds of the soil insecticide per acre by the dates prescribed in the treating instructions. A total of 76.7 acres, containing 362,048 items of growing nursery stock, is involved in the poisoned areas treated during the year. This acreage includes plots newly treated, those re-treated and brought back to their original dosage, and plots found upon analyses to have carried over a sufficient concentration of the lead arsenate. Seventeen tons of powdered lead arsenate were distributed on nursery plots by the owners in completing initial treatments and re-treatments. Some 1,200 pounds of this amount was applied to 94,463 square feet of heeling-in areas and coldframes.

Cooperative experiments with the Japanese beetle research laboratory resulted in the adoption of a treatment whereby certain species of azalea may be rid of Japanese beetle infestation by means of paradichlorobenzene fumigation. Interested nurseries furnished plants used in the tests, and were very anxious to have such a method approved. This new method permits certification of types of plants that are not tolerant to the commonly employed chemical

treatments. Growers previously have been obliged to raise them for certification in screened greenhouses or in beetle-proof outdoor enclosures. Simplification of azalea treatments offers a valued outlet for these plants to many growers who heretofore have considered the conditions of certification too rigid for compliance. Similar tests are being made with blueberry, holly, *Franklinia*, and rhododendron plants.

Supplemental distributions were made of the Japanese Beetle Quarantine Shipper's Guide, although no new edition of the guide was necessary, as the territory under regulation remained unchanged.

As a new departure in the service rendered to classified establishments, there was distributed to all such dealers a list showing the nurseries and greenhouses complying with the classification requirements. Monthly supplements mailed to the dealers keep this information current. As classified dealers whose premises are infested are required to report all their shipments of quarantined material to other classified establishments within the regulated areas, this list was supplied to avoid any noncompliance with this requirement due to lack of information as to those maintaining a classified status.

CERTIFICATION OF FRUITS, VEGETABLES, AND CUT FLOWERS

Heavy flights of the beetle during the summer of 1934 at a number of spur tracks in New Jersey at which large quantities of agricultural products are loaded in refrigerator cars made it necessary to intensify the methods used to prevent such cars from becoming infested. As soon as the cars were spotted for icing and loading, an inspector examined the ice bunkers and interior of the car for live beetles. Upon completion of the inspection and removal of any beetles present, the hatches of the ice bunkers and the doors of the car were closed and sealed until loading or icing began. If beetles were flying, the loading was delayed until the flight had subsided for the day. At Cedarville, N. J., a special beetle-proof canopy sufficiently large to cover an entire truck was constructed. This canopy was moved up to the door of a refrigerator car and the intervening space between the car and canopy screened with loose mosquito netting. The truck load of certified products was then backed into the cage and a canvas curtain lowered over the open end of the canopy. Any beetles present in the cage were killed with a contact insecticide applied from a hand sprayer. The doors of the car were then opened and the unloading proceeded. When one truck had unloaded, the doors of the car were closed until the next load backed in, when the procedure was repeated until the car was completely loaded. Pending construction of the canopy it was necessary temporarily to suspend from July 12 to 16 the shipment via refrigerator car of certified beans from the Cedarville siding.

As adult beetles during their heavy flight in Philadelphia were sufficiently abundant to reinfest inspected commodities, the usual 24-hour daily inspection service in that city was discontinued from July 11 to August 13, 1934, and the hours of inspection were shortened to from 4 a. m. to 10 a. m.

As in 1933, green beans were again shipped in large quantities to drought-stricken midwestern markets from the bean-growing districts in southern New Jersey, in Morrisville and Bustleton, Pa., surrounding Baltimore, Md., and on the Eastern Shore of Maryland and Virginia. All beans shipped under certification from these areas were run through cylindrical inspection machines to rid them of beetles. Most of the 6,030 beetles removed from farm products inspected during the season came from the 512,837 hampers of beans run through the machines.

Disappearance of the adult beetle from agricultural sections producing quarantined fruits and vegetables led to the lifting, effective on and after September 16, of the seasonal restrictions on the movement of these articles. This action advanced by almost a month the October 15 date prescribed by the regulations for the termination of this particular regulatory activity. Cut flowers continued to be likely carriers of the adult beetle, so requirements for inspection and certification of this commodity continued until the later date.

Based on 1934 observations, which indicated the hazards of beetle spread peculiar to the movement of fruits and vegetables of all kinds by refrigerator cars or trucks from sections of heavy infestation to noninfested territory, there was issued, effective June 1, 1935, a thirteenth revision of the regulations to safeguard such commerce. Under the new regulations certification is required for fruits and vegetables of all kinds when moved via truck or refrigerator car from the District of Columbia, and those parts of Delaware, Maryland, New Jersey, Pennsylvania, and Virginia known to be continuously and, at peak

emergence of the insect, densely infested with the beetle. As a condition of certification of fruits and vegetables, other than onions and potatoes, moving via refrigerator car from the zone of flight, there are required inspection and loading in a manner to prevent infestation, in a refrigerator car with closed or adequately screened doors and hatches, which car prior to loading has been determined by an inspector as thoroughly swept and cleaned by the common carrier in a manner to rid it of infestation. During the interval between cleaning and loading the car must be kept tightly closed and sealed. Fumigation, when deemed necessary by the conditions of beetle flight, is required in the case of onions and potatoes moving via refrigerator car from the same sections. No change in regulated area was involved in this revision of the regulations.

Tests were necessary to devise a method of fumigating refrigerator cars containing potatoes and onions shipped from heavily infested sections while the insect is in active flight. As finally devised, the equipment to be used consists of a pressure cylinder of liquid hydrocyanic acid with an applicator. By testing tips with various-sized holes, it was finally determined that one with a hole 0.002 inch in diameter would deliver 6 ounces of hydrocyanic acid in 1 minute under a pressure of 30 pounds. In practice the loaded refrigerator cars will be tightly closed, except for a narrow opening in one door through which a nozzle 3 feet long may be inserted. After discharge of the gas for 1 minute, the door is closed and the car sealed for a 2-hour fumigation period. Since adult beetles did not emerge during June in numbers sufficient to constitute a flight, this fumigation procedure was not employed during the present fiscal year.

Activities incident to the seasonal quarantine on fruits, vegetables, and cut flowers were fully organized on July 1, 1934. Inspectors were stationed at 37 inspection centers located at important shipping points throughout the regulated area. South-bound and west-bound trucks transporting fruits and vegetables from the heavily infested sections were required to report for inspection at platforms in Fredericksburg, Va., and Pittsburgh, Pa., respectively. This designation of inspection centers was occasioned by the fact that motor vehicles transporting certified products become infested with the flying beetles as the trucks proceed through the flight zone. With the scene of inspection transferred to a nonflight section, there were no such opportunities for reinfestation.

CERTIFICATES ISSUED, VIOLATIONS INVESTIGATED, AND PROSECUTIONS TERMINATED

In the course of the fiscal year a total of 484,427 certificates of all kinds were issued to cover products affected exclusively by the Japanese beetle quarantine.

Table 9 shows the quarantined articles intended for shipment from the regulated area and for use in certified greenhouses, or surface soil in nursery plots, heeling-in, or plunging areas, which were fumigated or sterilized during the 12-month period.

TABLE 9.—*Materials fumigated or sterilized under Japanese beetle quarantine regulations, fiscal year 1935*

Treatment	Plants	Potting soil	Mushroom soil	Leaf mold	Sand	Surface soil	Surface soil with plants	Berries	Bananas
	Number	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Cu. yds.*	*Sq. ft.*	*Sq. ft.*	*Crates*	*Bunches*
Arsenate of lead		74				76,768	1,600,254		
Carbon disulphide gas or emulsion	10,046	2,390	80	6	3,252	27,415		1,987	
Naphthalene		56				27,881			
Steam		699							
Hydrocyanic acid									87,001
Hot water	3,192								
Paradichlorobenzene	6,865								

Nursery and ornamental stock, sand, soil, earth, peat, compost, and manure were certified for shipment from the regulated areas during the fiscal year in the following quantities:

Plants	number	25,455,327
Sand, earth, and clay	carloads	5,829
Peat	do	58
Manure and compost	do	164

Fruits, vegetables, moss, and cut flowers certified during the seasonal quarantine on these articles were as follows:

Fruits and vegetables	packages	4,020,399
Moss	bales	2,628
Cut flowers	packages	23,102

Investigations were made of 1,361 apparent violations of the Japanese beetle quarantine regulations. These included interceptions by transit inspectors of the Bureau stationed at postal and common-carrier terminals and by highway inspectors examining road vehicles. In the course of the year prosecutions were successfully terminated in the United States district courts against 2 individual and 3 corporate violators.

TRANSFER OF HEADQUARTERS

Following transfer on September 10, 1934, of supervision of Dutch elm disease eradication work to L. H. Worthley, field headquarters of the Bureau directing Japanese beetle quarantine enforcement was removed in November from Harrisburg, Pa., to White Plains, N. Y. The new field headquarters is strategically situated in the areas jointly affected by the Japanese beetle, Dutch elm disease, and European corn borer, and is conveniently located near the gypsy moth infested zone.

COOPERATIVE ENTERPRISES

Four Canadian officials attended a tour of the heavily infested southern New Jersey territory on July 16, 1934, and the Syracuse, N. Y., district supervisor made field observations on the Niagara peninsular district with the Canadian officials preliminary to their 1934 trapping program. Cooperation was again accorded the Canadian Department of Agriculture in purchasing 500 Japanese beetle traps from a Philadelphia manufacturer.

Limited numbers of traps were operated for control purposes under State or municipal auspices in Delaware, Connecticut, Maryland, New Jersey, Rhode Island, and Massachusetts.

State appropriations were available for Japanese beetle quarantine or control operations in Connecticut, Delaware, Maryland, Massachusetts, New Jersey, New York, Pennsylvania, Rhode Island, and Virginia. Trapping operations in Maine, Indiana, Michigan, and Missouri were financed from funds allotted by the respective States or cities in which the work was performed.

INSECTS AFFECTING FOREST TREES

COOPERATIVE SERVICE

As in the past, one of the most important activities of the Division of Forest Insect Investigations has continued to be the cooperative service rendered to the several Federal agencies administering timberlands, such as the Forest Service, National Park Service, and Bureau of Indian Affairs, as well as to such emergency agencies as the Civilian Conservation Corps, the conservation program of the National Recovery Administration, and the shelterbelt program. Private owners have also been aided, but to a lesser degree. This cooperative service, for the most part, consists in surveys of bark beetle infestation, estimates of loss, recommendations as to methods of control, estimates of the cost of such operations, and technical direction of control projects. It might be added that such duties have more than doubled within the last few years, owing to the increased activity in forest-insect control in connection with emergency activities.

CONTROL PROGRAMS

MOUNTAIN PINE BEETLE

In California the epidemic of the mountain pine beetle which started in the Yosemite National Park and adjacent forests in 1931 and took a heavy toll of the fine sugar pine has been brought under control. Other projects against the same beetle in lodgepole pine stands in Crater Lake and Mount Rainier National Parks have been entirely successful. In the Rocky Mountain region the mountain pine beetle still continues its alarming destruction in some areas, while in others it is on the wane. On the Coeur d'Alene and Kootenai National Forests the control efforts begun in 1930 have resulted in the preservation of the valuable commercial white pine stands.

WESTERN PINE BEETLE

Encouraged by the results secured in recent years from well-planned extensive control operations the Forest Service, Park Service, Bureau of Indian Affairs, and private timber owners have been especially active during the last year in the control of the western pine beetle. In Oregon and Washington over 250,000 acres of pine timberland were covered with control work. A similar enthusiasm among both public and private protective agencies is also evident in California. In northern California the McCloud River Lumber Co. has committed itself to the policy of cutting and milling infested trees and destroying the infested bark. Although the timber thus salvaged contains considerable blue stain, there is a market for it, and from the standpoint of cost this method is much more advantageous than the wasteful one of burning the infested bark and leaving the logs to rot in the forests.

OTHER BARK BEETLES

Control operations against the Black Hills beetle in several forests in Colorado, against the Douglas fir beetle in Wyoming, and minor operations against threatening infestations of several species of *Ips* in a number of localities have also been carried through.

RESEARCH ACTIVITIES

Research work directed toward the development of more efficient and economical control methods against bark beetles has been continued, and in some cases slight modifications of previously used methods have led to excellent results. One such modification is based on the principle of preserving a larger percentage of the natural enemies of the mountain pine beetle, to bring about not only a numerical reduction of the pest but also a more favorable relation between parasite and host, thus assuring more lasting benefit from the control operation. Encouraging results have continued from experiments in killing bark beetles by means of penetrating oils applied to the bark and by the introduction of lethal materials in the sap stream of infested trees, but the methods are not yet sufficiently perfected to warrant their use in large-scale control projects.

The continued demand for nursery stock due to the remarkable activity of the reforestation program in connection with the Forest Service and with the various emergency activities, such as the erosion control work, the shelterbelt program, the Civilian Conservation Corps work, etc., has made the control of insects affecting forest nursery stock and newly established plantations of vital importance. Of the numerous insects important in these connections, the white grubs are by all odds the most destructive. A thorough investigation of these insects is under way, involving not only a study of their biologies, but also the development of control methods which will kill the grubs but will not injure the young trees. The nursery work is largely centered in the Southeastern States, while the work in plantations is centered in the Lake States.

The investigations on the locust borer in the Central States were continued along the line of preserving stands by means of stimulating new growth of trees from sprout growth following cutting of the badly infested trees and by mulching. The projects on the southern pine beetle, the white pine weevil, the beech coccus, the larch case bearer, the leaf-mining sawfly, the elm leaf beetle, and other native and introduced insect pests of trees in the East have also been considerably advanced. An extensive survey of the New England States to determine the occurrence of the balsam bark louse was made, and experiments in control, applicable to infested balsam trees used as ornamentals, were successfully conducted.

The work upon the insects associated with the Dutch elm disease has been greatly enlarged by the transfer of seven men to the Morristown, N. J., laboratory from the old Melrose Highlands, Mass., laboratory, and the employment of additional men on emergency funds. During the year a great amount of biological work has been done upon various insects found in elm, and much experimental work performed to determine insect vectors, with special reference to those which injure the bark either in feeding, ovipositing, or in the construction of brood burrows. During the year, as a result of field, laboratory, and greenhouse experiments, 50 cases of successful transmission of *Ceratostomella ulmi* by the smaller European elm bark beetle (*Scolytus multistria-*

tus Marsh.) from diseased to healthy trees have been recorded. Also in one case the disease has been isolated from a brood gallery made by the native elm bark beetle (*Hylurgopinus rufipes* Eichh.).

GYPSY MOTH AND BROWN-TAIL MOTH CONTROL

FEDERAL AND STATE FUNDS FOR GYPSY MOTH WORK

At the close of the fiscal year 1934, during which the work had been carried on under an allotment of funds from the Public Works Administration, it was necessary to reduce the field force so as to keep within the funds authorized by Congress for expenditure during the fiscal year 1935. These funds amounted to $360,000. A small balance was available from the Public Works Administration project to close up the work that remained unfinished at the end of the fiscal year. During this period over 280,000 gypsy moth egg clusters were treated in a limited solid area in Bernardston, Greenfield, and Leyden, Mass., and 812,000 feet of Government barbed-wire fence enclosing sprayed areas was removed and stored.

To supplement the funds available it seemed advisable to obtain as much assistance of an emergency nature as was possible. Acting under the sponsorship of the Department of Agriculture of the State of Pennsylvania, the relief administrators of Luzerne and Lackawanna Counties set up gypsy moth projects, which continued somewhat intermittently from late in the fall of 1934 to the end of the fiscal year 1935. The Conservation Department of Massachusetts and the State forester of Connecticut also supplied details averaging 20 men each from Civilian Conservation Corps camps located in or near the barrier zone in New England. As a result of this help, together with the regular funds set up by the cooperating States, the year's program of work was carried through, the primary objective being to reduce the heaviest and most threatening infestations. Scouting work for protective purposes in the outlying portions of the barrier zone and in Pennsylvania was attempted in only a limited way on account of the small number of trained scouts that could be spared from other work.

WORK IN AND ADJACENT TO THE BARRIER ZONE

This work was confined almost exclusively to territory in the southern part of Berkshire County, Mass., and in the northern part of Litchfield County, Conn., where small infestations had been found the previous year or where male moths had been caught at assembling cages during the previous summer. During the winter, 57 infested areas were located and 11,555 egg clusters were treated. This involved scouting of 83,071 acres of woodland and 373 miles of roadway. Two hundred and two acres of woodland were thinned, the most favored food plants removed, and the slash burned, and 3,547 acres of woodland were sprayed in June, burlaps being applied in the worst infested areas.

The New York Conservation Department, principally through enrolled men in Civilian Conservation Corps camps, scouted portions of Essex, Warren, Ulster, and Broome Counties west of the barrier zone and selected areas in Columbia and Dutchess Counties within the zone. No infestations were found in the counties west of the barrier zone in New York State, but 3 small infestations totaling 117 egg clusters were located in the town of Austerlitz, 1 infestation totaling 125 egg clusters in Hillsdale Town, and 2 rather serious infested points totaling 7,269 egg clusters in Dutchess County. These infestations were treated by the force supervised by the State conservation department and the areas were sprayed in June. Work was also carried on by that department in Nassau and Suffolk Counties, Long Island, and in the Borough of the Bronx, in New York. No infestation was found in Suffolk County, but in Nassau County 24 small infestations totaling 230 egg clusters were located in Oyster Bay Town and 18 infestations totaling 2,052 egg clusters were found in North Hempstead Town. Several square miles were found infested in the Bronx and 12,000 egg clusters were found and treated. All of the above areas were sprayed by the New York Conservation Department before the end of the fiscal year.

A Federal agent stationed at Roslyn, Long Island, certified 1,791 shipments of nursery stock and other material moving from the infested area on Long

Island. All of these shipments were free from infestation, except a single lot of cordwood on which one egg cluster was found. A limited amount of checking work was performed in a number of areas that had been scouted by the State force but no additional infestation was discovered.

GYPSY MOTH WORK IN CIVILIAN CONSERVATION CORPS CAMPS

In the area between the barrier zone and the Connecticut River, work has been carried on throughout the year by men allotted from 18 Civilian Conservation Corps camps. In most cases 20 men have been detailed from each camp for this work, which is carried on under the supervision of the gypsy moth office of the Bureau of Entomology and Plant Quarantine. One forest camp is located in Vermont, 5 in Massachusetts, and 7 in Connecticut, and, in addition to these, 5 camps under the control of the Department of the Interior are located in the Massachusetts area. This work is a continuation of that taken up during the previous fiscal year.

The average number of Civilian Conservation Corps men on the gypsy moth work on days when work was performed was 428. Owing to arrangements allowing for the making up of lost time on Saturdays, only 1.1 percent of available time was lost. This is a marked improvement over the record of the previous year, when 15 perecnt of available time was lost. During the year 103,445 6-hour man-days were used on the project, being some 26,000 more man-days than during the previous year. This increase in man-days made possible a large increase in the volume of work accomplished, especially hand control practices in severe infestations. The tree growth on a total of 407,653 acres of woodland and open country and along 1,441 miles of road was examined for gypsy moth infestation. This is slightly less than was accomplished the previous year, owing to the more intensive work done in infestations. Tabulations of the year's work show a large increase in accomplishments, with nearly a million individual trees examined and 4,685 destroyed. Fallen trees and branches and undesirable tree growth, also species particularly favored by the gypsy moth, were removed from 984 acres, leaving these stands less favorable for gypsy moth increase, and in better condition for future gypsy moth work. A total of 612,069 new egg clusters were found and treated. During May and June 1935, 396,933 trees were banded with burlap, and by the end of June 1,388,430 gypsy moth caterpillars were destroyed by men patrolling them. This type of work is seasonal and many more caterpillars will be crushed in July before the season is over.

The work has demonstrated the practicability of using Civilian Conservation Corps men for gypsy moth work in the area under consideration and has resulted in preventing large increases in the gypsy moth infestations in the area worked between the Connecticut River and the barrier zone and has materially decreased the danger of spread from this area into the zone.

During the year a large extension of the Civilian Conservation Corps gypsy moth work east of the barrier zone was proposed and, if put into operation, it will probably result in greatly extending this work for the coming year, although not to the extent requested.

WORK IN NEW JERSEY

On the northern rim of the area that was previously infested in New Jersey, several male moths were taken in the summer of 1934, in the townships of Mendham, Morris, and Randolph, and a single moth was captured in Pahaquarry Township near the Pennsylvania line. The State gypsy moth force carried on scouting work in the fall and winter in the first three townships and Federal agents were detailed to work in Pahaquarry Township and to scout certain sections in the townships previously mentioned near some of the cages where male moths had been captured the previous summer. In all, 3,612 acres of woodland were scouted and, in addition to this, 532 acres in the region of the Palisades near the George Washington Bridge, Fort Lee, N. J., were scouted by the State force. No infestation was found in Pahaquarry Township, but two locations, totaling 31 egg clusters, were discovered in Morris Township, and one consisting of 14 egg clusters was found on the Mendham-Randolph Township line. These areas were sprayed in June and a belt surrounding them, aggregating 178 acres, was also treated. The State and Federal forces cooperated in carrying through this work.

WORK IN PENNSYLVANIA

With the Federal and State funds available in the Pennsylvania area and the assistance from Luzerne and Lackawanna Counties previously referred to, it was found possible to scout intensively flood areas within the infested territory along the Susquehanna and Lackawanna Rivers, assembling-cage sites where male moths were captured last summer, sites of previously located infestations in outside territory, and to do considerable scouting and creosoting in the generally infested area. Woodland areas were thinned and the slash was burned in sections where effective scouting could not otherwise be done, sprouts were removed from stumps in territory previously cut over, and the most dangerous areas were sprayed during May and June. Burlap bands were also applied in woodland and residential sections where considerable infestation exists. These burlaps were patrolled and all caterpillars found were destroyed.

In a total of 70 infestations found during the fiscal year 1934 in 15 lightly infested townships, only 10 were reinfested in 1935, and 5 of these were in localities where only single egg clusters were found during 1934 and where no spraying was done. In the other 5 the trees along the property lines were not sprayed because wind drift would have caused the spray to lodge in adjoining property not covered by permits.

During the year 8,698 shipments of quarantined forest products, nursery stock, and other materials were inspected and a total of 70 gypsy moth egg clusters were found and treated. There were a few quarantine volations, and in each of the cases prosecuted by the State the defendants were found guilty.

SPECIAL SCOUTING

From the latter part of January to the last of April, special survey work was carried on with negative results west of the Hudson River in the extreme southeastern part of New York, in northeastern Pennsylvania adjacent to the New York and New Jersey State lines and the area where regular scouting work has been performed, in sections of northeastern and southern New Jersey where no scouting or cage work had previously been done, in New Castle County, Del., and in three townships in Cecil County, Md. The State authorities in these States and in Ohio were urged to do as much special survey work as time and funds would permit in territory where Federal work was not planned. Fifteen Federal experts were detailed to this work. They paid particular attention to trees and nursery plantings on large estates, around hotels, gasoline stations, cemeteries, and dumps; also in localities where large movable equipment used in construction work might have been used or stored. Although an average of not more than 4 days was spent in each town, the work was sufficiently well done so that it is believed any sizable infestation would have been noticed. The State of New Jersey furnished an inspector who worked with the Federal employee assigned to duty in that State. Pennsylvania and Ohio also did considerable work of this type. No infestation was found in any of the outlying territory.

SPRAYING

During the spraying season more than 7,700 acres of woodland and 6,300 residential properties were treated in the Pennsylvania territory, and the other areas are indicated under the States concerned. This involved the use of 61 high-power spraying machines in the following States: Massachusetts, 11; Connecticut, 12; Pennsylvania, 27; New Jersey, 2. In addition to these, 9 sprayers were loaned to the conservation department of the State of New York for treating infestations on Long Island, in the Bronx, and in Austerlitz and Milan in the barrier zone.

The weather during the spraying season was not so favorable as usual and considerable time was lost on account of rain and wet foliage.

Assembling-cage work was conducted in Vermont, Massachusetts, Connecticut, and Pennsylvania.

DEFOLIATION IN NEW ENGLAND

In the summer of 1934 defoliation caused by the gypsy moth was considerably in excess of that recorded for 1933. For the entire infested area a total of 492,361 acres of woodland with from slight to complete defoliation were found, as compared with 397,730 acres recorded for 1933. In general there was less

defoliation in the eastern part of the infested area than had been recorded in the several years immediately preceding. This was particularly true as to Barnstable and Plymouth Counties in Massachusetts. Beyond these sections the amount of defoliation increased considerably, particularly in New Hampshire, westward to the Connecticut River, and in Massachusetts from the central part of Worcester County to and beyond the above-named river. The records for the summer of 1934 showed that there was considerable increase in defoliation for Maine and New Hampshire. Massachusetts showed some decrease, owing principally to a decided decrease in the southeastern part of the State, which was not offset by a large increase farther west. There was a decided increase in the amount of defoliation in Rhode Island.

EFFECT OF DEFOLIATION ON FOREST GROWTH

Beginning about the middle of January 1935 an extended series of observations on the extent of gypsy moth infestation and damage caused to woodland was begun in several towns in the eastern part of Franklin County and the northwestern part of Worcester County, Mass. The purpose was to obtain accurate records of the degree of infestation, the types of growth, the natural conditions of the infested areas, and the amount of injury caused by defoliation. Areas were selected for which records of degree of defoliation in 1934 were available. One area was selected in Athol, 3 in Orange, 4 in Erving, and 8 in New Salem, Mass. This work has been under way for such a short time that it is hardly possible to draw very definite conclusions with respect to the effect of defoliation on all species of trees. It has been definitely established, however, that one complete defoliation is sufficient to kill hemlock, for in the Athol point 38 out of a total of 42 large trees of this species, ranging up to 55 feet in height, were killed by being completely defoliated in the summer of 1934. The other 4 trees in this group were not completely defoliated and still show signs of life. With respect to white pine, a section of the same point in Athol has quite a stand of small pines averaging about 5 or 6 feet in height. A count showed that one-sixteenth acre of this area contained 94 small pines. All of these were heavily defoliated in 1934, and at present 25 percent are dead and the remainder are in very poor condition. In all of the areas where white pines were selected within sections that were defoliated, these trees suffered injury, depending on the degree to which they were eaten. If they were completely defoliated they were killed. At a hillside location in Athol 42 pines ranging in height from 30 to 35 feet have died as the result of complete defoliation in 1934. Most of these pines attempted to refoliate after being stripped of their needles. Last winter they were more or less covered with the short, undeveloped new needles, but since then they have turned brown and are dead. For all of the 16 acres in which records are being taken the proportion of growth favored by the gypsy moth is rather high. In general, the growth most desirable for gypsy moth food consists in the main of white, red, black, and chestnut oaks, poplar, and gray birth. By actual and careful checks of the areas, which range in size from 2 or 3 up to 50 acres, these favored food plants comprise from 30 to 95 percent of the entire growth, the general average being between 60 and 70 percent. White pine and hemlock, which have been eaten so heavily, comprise from 5 to 60 percent of the woodland growth, the average probably being about 20 percent. The remaining growth, which might be considered only partially or not at all favored, consists of paper birch and red maple, with a scattering of other species. It can be seen, therefore, that for most of the area where the records are being taken the growth is, in the main, extremely desirable to this insect, and this fact is attested by the extent of defoliation that has taken place in those areas.

THE BROWN-TAIL MOTH

In general, there was a light-to-medium infestation of this species throughout practically all of the infested territory, but no instances of appreciable defoliation were reported during the summer of 1934. During the winter of 1934–35 numbers of winter webs were cut by the States in Maine, New Hampshire, and Vermont. For Maine only partial records are available, and this work was performed by men from three Civilian Conservation Corps camps. A total of 72,819 webs were cut and destroyed in 23 towns located mostly in the southern part of the State. In New Hampshire webs were cut in towns throughout the greater part of the infested area. A total of 1,548,287 webs

were cut and destroyed. Most of these were cut under the Emergency Relief Administration brown-tail-moth-removal project. A few were cut by men from Civilian Conservation Corps camps and a few more by the State entomologist. In Massachusetts a large proportion of the towns within the infested area were examined for webs and 169,352 were cut and destroyed. The winter was considered unfavorable for insect survival and these records indicate that persistent treatment will be necessary to keep this insect below a dangerous level.

GYPSY MOTH QUARANTINE ENFORCEMENT AND CERTIFICATION

REGULATORY CHANGES

Revised quarantine regulations were promulgated to become effective October 2, 1934. This involved the first change in the gypsy moth infested areas since 1931. On the basis of freedom from infestation as evidenced by the inspection of millions of Christmas trees over a period of years, supplemented by observations of district inspectors continuously stationed in the affected areas, it was possible to remove from the lightly infested territory in Vermont certain towns adjacent to the Canadian border and along the northwestern periphery of the infested zone. On the other hand, a number of towns in the lightly infested sections of Maine, New Hampshire, Vermont, and Connecticut were changed to heavily infested. This enlargement of the heavily infested section added a strip of territory from 1 to 3 tiers of towns wide on the northern boundary of the former area. Conditions of gypsy moth infestation in the affected towns were determined by special scouts of the gypsy moth quarantine unit and by Civilian Conservation Corps workers employed under the supervision of State officials. The finds were sufficient to justify these towns being considered heavily rather than lightly infested. The principal effect of this change in the administration of the quarantine is the embargoing of the movement of Christmas trees from these latter areas in which the trees formerly were eligible for certification after inspection. There were also a few minor changes in products affected by the certification requirements.

CERTIFICATION OF QUARANTINED PRODUCTS

Routine demands for inspection and certification were met by a force of 21 inspectors. Each inspector was assigned to a district and was held responsible for all details of quarantine enforcement in his district. When Japanese beetle and gypsy moth certification was required, this joint inspection service also was provided by the district inspectors.

Quarries and nurseries in sections of the lightly infested area in which gypsy moth infestation had not previously been found were scouted for egg clusters. The nurseries concerned had previously been scouted and found free from the Japanese beetle. Determination of freedom from gypsy moth infestation of these establishments and their surroundings allowed them to receive permits for their shipments without detailed inspection of each article.

Christmas-tree inspection was performed from mid-November until December 15. Mild weather during much of this period facilitated examination of the trees. At the peak of the inspection early in December, 60 temporary inspectors were employed. During the 1934 shipping season there were certified 377 carloads of trees. In addition, 206 carloads were shipped from the 41 Vermont towns released from quarantine in October. This total of 583 cars shipped from the areas as previously regulated is compared with a total of 459 carloads certified therefrom in 1933. As the inspected trees all originated in the lightly infested area, only a single gypsy moth egg cluster was found.

Presence during the fall of large numbers of gypsy moth egg clusters on laurel led to a change in the procedure whereby this commodity was certified. Laurel branches in large quantities or after processing into roping, wreaths, or funeral pieces cannot be satisfactorily inspected. Therefore, actual inspection was limited to loose branches in small quantities. The bulk of this material was inspected on the lot basis. In this manner, entire uninfested sections within which it was safe to pick laurel were designated after thorough scouting of the localities. Shippers desiring to manufacture decorative articles containing laurel for movement under certification were given certificates for material obtained from these uninfested sections.

From early in October until the first week in December, inspections were made of 161 lots from which evergreen boughs were gathered for shipment.

The scouted lots, totaling approximately 10,000 acres, were located in the lightly infested gypsy moth area of western Massachusetts and southern Vermont. All inspections gave negative results. A total of 30,700 bales of boughs was certified for movement from these lots.

The quantities of articles of the respective quarantined products certified during the fiscal year are summarized in tables 10 to 13. The number of gypsy moth egg clusters removed from inspected products showed a 350-percent increase over the preceding year.

TABLE 10.—*Nursery stock certified under gypsy moth and/or Japanese beetle quarantines, fiscal year 1935*

Material	Quantity	Certificates issued	Gypsy moths found	
			Egg clusters	Larvae and pupae
		Number	*Number*	*Number*
Shrubs	696,460	5,756	2	0
Specimen trees	54,438	1,149	0	0
Young trees	167,413	1,078	3	0
Specimen evergreens	84,688	1,801	0	0
Young evergreens	1,690,794	6,579	7	0
Seedlings, cuttings, and small plants	943,676	3,823	0	7
Potted greenhouse plants	32,648	922	0	0
White pine trees	85,179	145	1	0
Total	3,755,296	21,253	13	7

TABLE 11.—*Evergreen products certified under gypsy moth quarantine, fiscal year 1935*

Material	Unit	Quantity	Certificates issued	Gypsy moths found	
				Egg clusters	Larvae and pupae
			Number	*Number*	*Number*
Boughs, balsam twigs, and mixed greens	Box or bale	39,514	5,370	0	0
Christmas trees	Number	888,189	214	0	0
Laurel	Box or bale	13,561	3,423	[1] 2	0
Miscellaneous	Box	5,470	713	0	1
Total			9,720	2	1

[1] In addition, 30 larvae of the brown-tail moth were removed from laurel.

TABLE 12.—*Forest products certified under gypsy moth quarantine, fiscal year 1935*

Material	Unit	Quantity	Certificates issued	Gypsy moths found	
				Egg clusters	Larvae and pupae
			Number	*Number*	*Number*
Barrel parts, crates, crating	Bundle or case.	2,585	1,194	1	0
Logs, piles, poles, posts, ship knees, and ties	Piece	269,350	3,954	50	2
Fuel wood	Cord	2,943	996	225	0
Pulpwood	do	35,948	1,491	27	0
Lumber	Board feet	23,502,078	2,455	1,321	140
Empty cable reels	Number	32,744	3,057	0	0
Shavings	Bale	24,021	141	0	0
Shrub and vine cuttings	Box	426	167	0	0
Miscellaneous	Number	955,812	701	5	0
Total			14,156	1,629	142

TABLE 13.—*Stone and quarry products certified under gypsy moth quarantine, fiscal year 1935*

Material	Unit	Quantity	Certificates issued	Gypsy moths found	
				Egg clusters	Larvae and pupae
			Number	*Number*	*Number*
Crushed rock	Ton	927,190	1,354	0	0
Curbing	Running feet	50,208	155	0	0
Feldspar	Ton	4,856	239	0	0
Granite	Piece	46,546	2,855	[1] 2	8
Do	Running feet	72,700	30	0	0
Monumental stone	Piece	13,179	9,526	1	0
Grout	Ton	13,768	413	0	0
Marble	Piece	22,245	88	0	0
Paving blocks	Number	1,817,692	476	368	167
Miscellaneous	Piece	27,475	539	0	0
Do	Ton	4,693	30	0	0
Total			15,705	371	175

[1] This does not include 28 egg clusters found on cleating and blocking used to secure granite on cars.

ROAD PATROL

Highway inspection on roads leading from the lightly infested sections to nonquarantined territory started with the stationing of an inspector on the Mohawk Trail near Savoy, Mass., on September 12. The first interception of a gypsy moth infested plant was made on September 24. From October 15 to 27, 13 additional posts were established—3 in Massachusetts and 10 in Connecticut. Early in November five posts were established on the border of the lightly infested area in Vermont. Closing of all posts was accomplished between December 3 and 22. Two supplemental posts were operated in southeastern Connecticut for short periods just prior to the discontinuance of this work. When operating at their full capacity, these posts were manned by 53 road inspectors. Six infested lots of material were halted at the posts and found to contain 1 broken and 26 normal egg clusters. Just prior to closing of the posts for the season, a truck containing 138 uncertified Christmas trees was stopped while en route from Lewiston, Maine, to Jamaica, Long Island. Examination of about one-third of the trees disclosed 20 gypsy moth egg clusters. The entire load was ordered returned to the generally infested area. Another important interception led to the discovery of 75 egg clusters on cordwood already trucked to Port Chester, N. Y., a point outside the quarantined zone.

VIOLATIONS

Investigations were made of 416 apparent violations of the gypsy moth and brown-tail moth quarantine. In the Bureau's first prosecution for violations of the gypsy moth quarantine in over 10 years, a commercial shipper and a common carrier were each fined for the shipment and transportation of uncertified fuel wood from Harrington, Maine, to Elkins Park, Pa. A third prosecution was pending in the United States District Court of Southern New York at the end of the fiscal year.

BROWN-TAIL MOTH SCOUTING

Observations by district inspectors disclosed scattered infestations of the brown-tail moth in Orono, Maine, and two small infestations in Old Town, Maine. Both of these towns are outside the brown-tail moth regulated zone, but within the lightly infested gypsy moth restricted zone.

SATIN MOTH SCOUTING

Scouting for satin moth egg clusters beyond the boundaries of known infested territory was performed late in July and early in August. Poplar and willow trees were examined for presence of the egg masses. At the conclusion of the

survey, infestations had been found in seven towns in which the moth was not previously known to exist. One of the new infestations is in southeastern Connecticut, 2 are in New Hampshire, and 4 are in Maine.

Within the infested section, satin moths were noticed depositing egg masses at Concord, N. H., as early as June 6. In northeastern Maine moths were found ovipositing as late as August 2. District inspectors in New Hampshire and Maine observed very little satin moth feeding, as compared with the 1933 defoliation. In some localities where large numbers of hibernating larvae were noted in the fall of 1933 there were no signs of feeding in the summer of 1934. Satin moth egg clusters were not as numerous in the quarantined zone as they were in the summer of 1933.

By arrangement with the Division of Foreign Plant Quarantines, an inspector from the port inspection office at Seattle, Wash., was detailed from July 22 to August 12 to scout a tier of counties in central Washington east of the area in the State designated as satin moth regulated area. Observations were confined to black cottonwoods and willows, the host trees of the insect in the Pacific Northwest. Three weeks' scouting in Klickitat, Yakima, Kittitas, Chelan, and Okanogan Counties gave negative results.

DUTCH ELM DISEASE ERADICATION

SYSTEMATIC SCOUTING

At the outset of the fiscal year elm trees confirmed as infected with the Dutch elm disease (*Ceratostomella ulmi* (Schwartz) Buisman) numbered 2,012 in New Jersey, 8 in Connecticut, and 1,235 in New York. This total of 3,255 diseased trees had been discovered as a result of scouting operations carried on in a tri-State area of 1,400 square miles since the disease was first detected at Maplewood, N. J., in June 1933.

Systematic scouting, already under way for several weeks on July 1, 1934, continued until the end of August, when reduced funds necessitated dismissal of Federal scouts. Scouting was continued in New York with men employed on State funds until brisk autumn winds in October defoliated the elms and forced abandonment of foliage scouting for the season. Before discontinuance of summer scouting, all of the originally known infected area in New Jersey and Connecticut had been surveyed twice, and the New York State scouts had finished a partial third survey. Discovery of infection at points near the margin of the infected zone required several extensions of the 10-mile protective zone included as an additional work area circumscribing the known infections. It was principally in these extensions that scouting was hurried and incomplete.

Definite and severe wilting of elm foliage, later confirmed as Dutch elm disease infection, was first observed during the summer of 1935 in the Bronx, New York, N. Y., on May 16. Systematic scouting from that date to the end of June resulted in the finding of 904 additional cases of infection, 559 located in New Jersey, 341 in New York, and 4 in Connecticut.

EXTENSION OF WORK AREA

Discoveries of infected elms at points beyond the previously known diseased area were made during July, August, and September 1934 at 6 points in New York, 4 locations in New Jersey, and 3 towns in Connecticut. New Jersey finds were made 3 miles north of Hopewell in Montgomery Township, Somerset County; at Petersburg, in Morris County; at Echo Lake, in Passaic County; and at Princeton, in Mercer County. The most remote infections found in New York during 1934 were at Katonah, Cross River, and Crugers, in Westchester County; Stony Point and Sloatsburg, in Rockland County; and just west of the Suffolk-Nassau County line near the village of Central Park on Long Island. Contiguous to the 1933 known infected zone in Connecticut, new infections were found in Norwalk and about 4 miles north of the village of Fairfield, both points in Fairfield County.

New finds at points isolated from the tri-State zone of infection comprised 1 infected tree in Old Lyme, New London County, Conn., 4 in Indianapolis, Ind., and 1 in Norfolk, Va. As a result of 1934 scouting in Cleveland, Ohio, where the disease was found in 1930. 1931, and 1933, two additional infected trees were removed.

Included in the tri-State infected zone at the end of the fiscal year was a total of 2,478 square miles, of which 1,402 square miles were in New Jersey,

852 in New York, and 224 in Connecticut. This was an increase of approximately 1,075 square miles over the area known to be infected at the end of the previous fiscal year. The 10-mile protective zone in which scouting and sanitation work were also performed amounted to an additional 2,170 square miles, making a total work area of 4,648 square miles.

PROGRESS IN REMOVAL OF DISEASED TREES

Just prior to the 1934 field scouting, 1,487 infected trees had been removed and 5 trees known to be infected were standing. This was the nearest approach to complete removal of infected trees accomplished up to that time. As the summer's scouting progressed the number of standing infected trees increased, until at the end of July there were 2,983 infected trees still standing. Cases of infected trees numbered 1,682 in July, 1,998 in August, 391 in September, and 228 in October. When determinations of infection began to decrease in September an opportunity was afforded for reducing the number of standing infected specimens. With the exhaustion in September of New Jersey funds allotted for removal of infected trees, there still remained at the end of 1934 a total of 1,325 infected trees, 1 of which was in Connecticut, 4 in New York, and the remainder in New Jersey. Eradication crews organized under the allotment of P. W. A. funds available late in December soon reduced the number of infected trees as the sanitation work progressed throughout the affected territory. By February 2 the few remaining infected trees in Connecticut had been felled and burned. New York was entirely free from standing infected elms by March 30. In New Jersey, all elm trees that could be confirmed by laboratory diagnosis were eradicated by April 15. Laboratory cultures made from dead and dying trees removed during November and December and in the course of the large-scale sanitation program extending from December 28 to May 10 determined 416 cases of Dutch elm disease. Scouting by the permanent personnel and newly trained scouts placed in the field under the work-relief program in June located 891 additional infections. With this addition of 5,606 confirmations of infection during the fiscal year, the total of diseased trees detected thus far in the major infected zone increased from 3,255 to 8,861.

QUARANTINE RESTRICTIONS TO PREVENT ENTRY OR DISSEMINATION OF INFECTION

Foreign Quarantine No. 70, originally effective October 21, 1933, to regulate the importation from Europe of elm logs or elm material with bark attached, was amended, effective January 1, 1935, to place an embargo against the importation of elm veneer logs. Domestic Quarantine No. 71, effective February 25, 1935, imposes a rigid embargo on the movement of all plants or parts of plants of all species of the genus *Ulmus* from the known diseased area in Connecticut, New Jersey, and New York. State quarantines prohibiting the intrastate movement of host material from infected sections are also in operation.

COOPERATIVE ENTERPRISES

Under cooperative agreements between the Bureau and the infected States, each organization has accepted certain definite phases of the work. Scouting for the purpose of locating diseased trees and dead or dying elms is designated as a Federal activity. Culturing of twigs from elms suspected of harboring infection is performed by employees of this Bureau working under the supervision of the technician in charge of the laboratory of the Division of Forest Pathology, Bureau of Plant Industry, at Morristown, N. J. Information concerning infected specimens is turned over to the State control organization. State officials then contact owners of diseased, dead, or moribund trees to secure permission for removal. Most of the tree removal in New York and New Jersey was performed under contracts let by the State projects to commercial tree firms, municipal shade-tree commissions, and other organizations experienced in this type of work. A number of eradication crews were also employed on State funds. Insofar as funds were available, the few diseased trees requiring removal in Connecticut were felled and burned by town authorities. In New Jersey, contracts for diseased-tree eradication rapidly exhausted the $30,000 appropriation and the State eradication program was halted on September 15. New York State continued its removal of infected trees, but

in Connecticut and New Jersey felling and burning of diseased trees was taken over as a Federal activity with the inauguration of the Bureau's sanitation program in January.

Finances to carry on scouting and eradication were obtained from a variety of sources. Available at the beginning of the fiscal year was a regular Bureau appropriation of $150,000 and an allotment of $6,000 from the National Recovery Administration. On December 21, 1934, a fund of $667,000 was allotted to this work by the Public Works Administration. As the regular appropriation bill contained a clause providing that the Dutch elm disease appropriation could not be augmented by emergency funds of Federal origin without reimbursing the Treasury for the amount so added to the regular appropriation, up to the total of that appropriation, the emergency funds actually expended amounted to $527,000. These emergency funds were exhausted in May 1935. On May 28, an allotment of $250,000 was approved from work-relief funds. Reorganization of the project on a work-relief basis was in progress at the end of the fiscal year.

State appropriations of $30,000 each were available at the beginning of the fiscal year in New Jersey and New York. In August 1934 an additional New York appropriation of $142,500 for Dutch elm disease control work became available. New Jersey funds were largely exhausted by the middle of August 1934, and not until the following June were further New Jersey funds allotted to Dutch elm disease eradication. On June 8 a State emergency appropriation of $25,000 became available in New Jersey for scouting and eradication activities. Several Connecticut garden clubs cooperated in employing scouts to survey their respective towns.

ELM SANITATION ACTIVITIES

When emergency funds allotted by the Public Works Administration became available on December 28, 1934, it was possible to build up an organization capable of quickly eradicating all standing, infected trees, and in addition make heavy inroads on dead and dying elms existing in the major diseased section. Decision to remove the latter type of trees was justified by the fact that they constitute potential sources of infection or are possible breeding places for the known vectors of the disease. Under conditions prescribed for employment on public-works funds, suitable men were selected from among those registered at the offices of the National Reemployment Service in the counties where the work was performed. As many experienced tree surgeons and tree climbers were unemployed during the winter, an efficient corps of workers was assembled. By the end of January 791 temporary men had been employed. Workers paid from emergency funds reached a maximum of 1,174 just prior to dismissal of the sanitation force on May 10 because of lack of funds. With disbandment of the crews, most of the Federal sanitation work was discontinued until reorganization of the work on a relief basis was begun in June 1935. The State of New York assisted in this work by taking over 144 eradication-crew members for 10 days, starting May 25. In furtherance of this work during Federal inactivity, an emergency New Jersey appropriation was available on June 8 for the employment for a period of 3 weeks of twenty-five 6-man eradication crews and fifty 2-man scout crews.

By the end of the fiscal year, scouts had tagged some 690,000 dead or dying trees, with the additional marking for destruction of 335,000 miscellaneous elm units, comprising stumps, slash, logs, and fuel wood. When eradication crews were operating at capacity in March and April their weekly production frequently exceeded 20,000 trees and 14,000 miscellaneous units. In the course of the 4½ months' intensive sanitation program eradication crews removed or destroyed approximately 460,000 dead and dying trees and 160,000 stumps or other miscellaneous units. This left at the end of the fiscal year a residue still marked for destruction of 230,000 trees and 175,000 other elm units.

Men assigned by the Civilian Conservaton Corps to Dutch elm disease eradication under the supervision of Bureau employees were a major factor in much of the elm-sanitation work performed in woodland areas. At the end of the year approval had been granted for the construction of 3 Civilian Conservation Corps camps in New Jersey, 2 in New York, and 1 in Connecticut. When fully organized, these camps will be devoted exclusively to Dutch elm disease control activities.

Coordination and active direction of the work were supplied by a skeleton force of federally appointed men. This reached a maximum of 179 at the

peak of the summer season, following which the number was reduced to about 30 for the second quarter. With organization of the sanitation work early in 1935 the permanent force was increased to around 60.

INFORMATIONAL ACTIVITIES

Publication in March of a 4-page circular, The Dutch Elm Disease Eradication Project: Federal, State, and Local Cooperation, assisted materially in responding to the hundreds of communications received from individuals and city and town officials, garden clubs, and civic organizations expressing a lively interest in combating the disease now threatening the American elm. Circulars or bulletins were issued on the subject by the New Jersey and Connecticut Agricultural Experiment Stations and the New York State College of Agriculture. There has been a constant demand for educational mounts showing the characteristic symptoms of the disease and specimens of its principal known insect vector. This has been met by distribution of mounts containing well-labeled specimens of sterilized elm wood showing characteristic streaking, together with specimens of *Scolytus multistriatus* Marsh. and examples of this beetle's engravings.

WHITE PINE BLISTER RUST CONTROL

As a result of an allotment of funds by the Public Works Administration in August 1933 and the assignment of a large amount of labor from the Civilian Conservation Corps, more extensive areas of white pine were given protection against blister rust during the past year than in any similar period since the work was begun about 18 years ago.

Control measures consist of destroying currant and gooseberry plants (*Ribes*) growing in or near the pine stands, and local protection by this means is effective. Regardless of the intensity of the disease in the vicinity, blister rust cannot attack pine if there are no currant or gooseberry plants within the infecting distance of 900 to 1,500 feet of the pine, except that the cultivated European black current is so susceptible that it is necessary to destroy it throughout the white pine regions, particularly when within a mile of white pine stands.

The pine areas to be protected in the United States total about 14,200,000 acres, and the border zones increase the areas from which currant and gooseberry plants must be removed to about 24,800,000 acres. In the Northeastern States about three-fourths of the control areas have been given initial protection; in the Western States about one-third; in the southern Appalachian States about one-fifth; and in the North Central States less than one-half. In 1934 in the country as a whole, 200,169,993 currant and gooseberry bushes were destroyed on 3,358,209 acres of white pine land with 932,916 man-days of labor. The Civilian Conservation Corps supplied 525,366 man-days of labor for this work and destroyed 83,779,865 currant and gooseberry bushes on 946,717 acres of land. The remainder of the work was performed with P. W. A., State, and local funds. Over 20,000 men were employed on control work, about half of whom were Civilian Conservation Corps enrollees assigned to this project from 267 camps. The work was carried on in cooperation with 31 States and with Federal agencies responsible for the administration of public lands. The results are given in table 14.

TABLE 14.—*Ribes-eradication operations for the calendar year 1934*

Region	Total pine area of sufficient value to justify protection	Control area (including border zones)	Area covered in 1934	Effective labor in 1934	*Ribes* destroyed in 1934
	Acres	*Acres*	*Acres*	*Man-days*	*Number*
Northeastern States	7,600,000	12,842,240	813,073	219,393	23,133,684
Southern Appalachian States	1,100,000	5,353,500	1,157,885	22,056	2,354,377
Lake States	600,000	1,692,585	500,220	148,732	40,231,329
Western white pine (Idaho, Washington, Montana, including Mount Rainier)	2,700,000	2,710,129	670,257	474,108	113,694,311
Sugar pine (California and Oregon)	2,200,000	2,200,316	216,774	68,627	20,756,292
Total	14,200,000	24,798,770	3,358,209	932,916	200,169,993

Pine-disease surveys are conducted to a limited extent each year as opportunity arises. The purpose of these surveys is to determine the point at which local control measures should be instituted in the immediate future. The discovery of blister rust in a new section means that the white pines in that section can be expected to suffer serious loss unless local control measures, including *Ribes* eradication, are promptly carried out.

Continued spread of the rust in the East was evidenced by the finding of the disease on white pine for the first time in Sussex and Passaic Counties, N. J.; Allegany and Garrett Counties, Md.; Pendleton County, W. Va.; Geauga County, Ohio; Dubuque County, Iowa; Becker County, Minn.; Chippewa, Jackson, Marathon, Oneida, Adams, and Lincoln Counties, Wis.; and in Ontonagan, Leelanau, Emmet, Otsego, Alcona, and Sanilac Counties, Mich. Infection on *Ribes* was found for the first time in Nelson County, Va., and in Frederick and Montgomery Counties, Md.

In the West a new pine infection center was located on Steamboat Creek, Douglas County, Oreg., about 100 miles from California, but scouting in the sugar pine forests of northern California failed to reveal the presence of the rust. In the western white pine region of northeastern Washington, northern Idaho, and northwestern Montana, 39 new centers of pine infection were reported, making a total of 129 for the region. All of these have developed within the last 12 years and there are undoubtedly many others still undiscovered. Of the 39 new centers, 8 were in northern Idaho and northeastern Washington on the Kaniksu National Forest, 1 on the Lolo National Forest, and 4 on the Cabinet National Forest in Montana. This is the first record of pine infection in Montana and in these national-forest units.

Careful inspection and study of white pine areas show that very little new infection is occurring on white pines in the areas that have been brought under control by the eradication of *Ribes*, but in similar unprotected areas the rust is increasing rapidly and causing serious losses in white pine stands, particularly among the younger age classes. This steady spread and intensification of the rust in unprotected areas is indicative of the need for vigorous and continuous application of control measures to protect the valuable white pine forests of this country.

Since the European or cultivated black currant (*Ribes nigrum*) is more susceptible to blister rust than any other species of *Ribes*, and is one of the chief agents in its long-distance spread and local establishment, the eradication of this plant in white pine regions is a general control measure that will be of material aid in checking the spread of the disease. During the past season 70,927 of these plants were eradicated in six Northeastern and Lake States. This work has been completed in Rhode Island and in large parts of several other States. In the Appalachian region black currants are very scarce, and in the West they have been eradicated in the western white pine and sugar pine regions.

In order to prevent the distribution of the disease through the movement of infected white pine planting stock, *Ribes*-free zones are established and maintained around nurseries in cooperation with the owners. In establishing these zones all *Ribes* are eradicated within 1,500 feet and all cultivated black currants within 1 mile of the nurseries. These zones are kept free of *Ribes* by yearly inspection and reworking where necessary. During 1934 this work was carried on around 74 nurseries in 18 States, thus affording protection for millions of white pines being grown for forest and ornamental planting. The number of these nurseries certified as having completely protected pines that could be authorized for interstate shipment is discussed in the report of the Division of Domestic Plant Quarantines.

Pre-eradication surveys were completed on 2,041,487 acres, of which 821,223 acres were in the eastern white pine regions, and 1,220,264 in the western white pine and sugar pine regions. This work makes it possible to determine the location, the acreage, and the *Ribes* conditions on areas having sufficient white pine values to warrant their protection from blister rust. The results of this work make it possible to decide on the eradication methods that will accomplish most on each area and to make a reasonably close estimate of the amount of work necessary to establish control.

A survey of forest lands in Colorado and Wyoming was initiated in 1934 to determine the distribution and value of white pines in these States and to ascertain the number and species of *Ribes* occurring in these stands as a basis for applying control measures. The forests of these two States aggregate about 31,500,000 acres within the boundaries of 24 national forests, 3 national

parks, and 1 Indian reservation. So far the results of the survey show that there are over 4,250,000 acres on 12 national forests, 3 national parks, and 1 Indian reservation supporting white pine, and that over 500,000 acres of this area support comparatively valuable white pine stands. The white pines consist of three species—*Pinus flexilis*, the limber pine, which occurs throughout the timbered areas of both States; *P. albicaulis*, the white-bark pine, found in northwestern Wyoming; and *P. aristata*, the bristlecone pine, which occurs in all the forests of Colorado except the extreme northern and northwestern ones. The commercial value of these white pines was not great, although they provide railroad ties, mine props, lumber, fence posts, and fuel wood for local use. In addition, they are very valuable for the protection of watersheds, the prevention of soil erosion, and the sheltering of wildlife, and for recreational and scenic areas. There are 11 species of *Ribes* in this region. In abundance they range from 1 to 38 bushes per acre in the upland types and from 18 to 279 bushes per acre in the moist stream bottoms. It appears that on the areas supporting good white pine stands the control of blister rust by *Ribes* eradication would be practicable at a moderate cost.

WHITE PINE BLISTER RUST QUARANTINE ENFORCEMENT

An increased demand for white-pine stock was noted by nurserymen applying for Federal shipping permits last year. Commercial nurseries inspected for Federal certification in the spring of 1935 were found to be practically sold out, and this Bureau has received more applications for permits from Federal and State nurseries than in previous years. The practicability of growing rust-free pines in infected regions, under the sanitation requirements of the white pine blister rust quarantine, has been demonstrated. The quarantine requires *Ribes*-free zones for the growing of five-leafed pines in infected States for interstate shipping under Federal permit. After a nurseryman effects eradication of currant and gooseberry plants within the specified zones, under the leadership of trained State and Federal blister rust control agents, an inspector of this Bureau makes a search for any remaining sprouts or seedlings, and the crew may be required to cover the area repeatedly before the nursery is finally certified. Each year thereafter the environs are inspected for sprouts, seedlings, or home plantings of currants and gooseberries in the sanitation zones. Twenty-eight nurseries, including State nurseries of Idaho, Virginia, and Ohio, and United States Forest Service nurseries in West Virginia and Montana, were certified during the fiscal year and were granted pine-shipping permits. A third Forest Service nursery, having destroyed several thousand *Ribes* seedlings in the surrounding zones, was approved for white pine seeding.

The quarantine was amended, effective March 15, 1935, to require that shipments of currant and gooseberry plants to Minnesota must be accompanied by a control-area permit from that State. Such action was in recognition of a recent Minnesota regulation setting aside two pine-growing areas in which no currant or gooseberry plants may be grown. Ten States have now set aside such areas, legally established, and the Federal quarantine regulations provide that no *Ribes* may be shipped to these States without a control-area permit from the quarantine officer of the State of destination.

Transit inspectors enforcing quarantines at railway terminals intercepted 73 violations during the fiscal year, and vehicular inspectors of the Japanese beetle force reported 140 interceptions of auto tourists transporting uncertified white pines from blister rust infected States. At terminal stations the restricted plants were turned back to the senders. At roadside stations they were seized and destroyed. California State officers reported the interception of European black currants arriving from Utah. New Jersey State officers furnished information as to an individual hauling uncertified native white pines from New York State for sale. The State officers were able to check this hauling.

CEREAL AND FORAGE INSECTS

GRASSHOPPERS

During the fall of 1934 an extensive survey of grasshopper conditions was conducted in cooperation with the 18 States included in the control campaign which was completed during the summer. This survey indicated a great reduction in grasshopper populations over most of the area included in the

control campaign. The heaviest infestations were centered in Michigan, Wisconsin, Minnesota, North Dakota, and Montana, but grasshoppers occurred in sufficient abundance to require control in the States of South Dakota, Iowa, Colorado, Wyoming, Kansas, Arizona, Idaho, California, Nevada, and New Mexico. A considerable portion of this reduction in populations, compared with 1934, may be attributed to the success of the control campaign. The infestation in the northern part of North Dakota and Minnesota was undoubtedly increased by migrations of grasshoppers from Canada. The requirements of the various infested States for control in the spring of 1935 were successfully met with the funds and materials available.

CHINCH BUG

After the completion of the control campaign late in the summer of 1934, a survey of chinch bug abundance was conducted, cooperatively with various States in the Corn Belt, to determine their probable abundance in the spring of 1935. This survey revealed the presence of the highest overwintering populations of chinch bugs on record in Ohio, Indiana, Illinois, Missouri, and Iowa, and populations of menacing proportions in the States of Oklahoma, Kansas, and Nebraska, and in southern Minnesota, Wisconsin, and Michigan. A considerable increase in the area covered by the infestation was also observed. Recognizing the emergency nature of this situation, should spring weather conditions be favorable for chinch bug development, Congress appropriated $2,500,000 for the control of these insects. The very cold, wet spring delayed migration until after June 30, the indications being that, although severe local outbreaks could be expected in some of the States involved, the extremely wet weather over most of the area had reduced the outbreak to a level at which it was not so serious as that occurring in 1934. In Oklahoma, Kansas, and Nebraska the infestation was practically eliminated. Detailed studies on improving barrier methods and materials, and in determining methods of preventing severe infestation by reducing or eliminating certain of the small grains are being made, and more accurate methods of evaluating chinch bug abundance have been developed.

EUROPEAN CORN BORER

In the summer of 1934, in addition to the usual abundance surveys made in selected areas known to be infested, a survey was conducted to discover any extension of European corn borer invasion around the margins of the known infested area. This survey revealed only minor spread of the borer during the past 2 years. Damage surveys indicated extensive loss to sweet-corn growers along the eastern seaboard, particularly in Massachusetts and Connecticut, and on Long Island. An increase in infestation was noticed in New Jersey and in two counties on the Eastern Shore of Virginia. However, the infestations in the one-generation area in western New York, Ohio, and Indiana has maintained approximately the same degree of severity for the past 3 years. During this period climatic conditions have been definitely unfavorable to corn borer increase.

Varieties of field corn resistant to corn borer attack have been further tested and have maintained their resistance to the borer. In cooperation with the Bureau of Plant Industry, further crosses have been made of these resistant varieties, and an effort is being made to discover new resistant characters and new strains resistant to the borer. This work has now been extended to studies of resistance in sweet corn for utilization in the sweet-corn canning areas and market producing centers.

ALFALFA APHID - *Illinoia pisi*

Resistance of alfalfa to the attack of the alfalfa aphid, approaching absolute immunity, has been definitely proved in a number of strains selected from varieties of alfalfa widely grown in Kansas and California. These strains have been carried through a number of generations and subjected to severe test. Results indicate that resistance is inherited. Repeated attempts to isolate strains of aphids that are able to survive on the resistant plants have resulted in failure. An effort is being made, in cooperation with the Bureau of Plant Industry, to develop strains of alfalfa having desirable agronomic characters combined with resistance to aphid attack.

WHITE GRUBS

A new laboratory has been established at Madison, Wis., for the purpose of studying the various species of white grubs infesting Wisconsin and surrounding States, to supplement similar work under way in Indiana. Although the wet season greatly reduced the amount of white-grub damage experienced, as compared with that occurring in 1934, this is still a major problem in the production of good pastures and a number of grass crops. Studies on the feeding habits of the beetles have indicated that they feed widely on a number of herbaceous plants scattered throughout pastures and cultivated areas, in addition to the foliage of certain trees and shrubs. This observation has an important bearing on the possibility of control of the beetles by spraying shrubs and trees on which they were previously believed to depend almost exclusively for food.

HESSIAN FLY

Studies to determine the best date of seeding to prevent hessian fly damage to wheat have been completed and discontinued in most of the area included in the middle Great Plains States. Determination of the best date of seeding has not yet been accurately made for the Eastern States, and date-of-seeding plots are still being maintained in this region.

Extensive tests of a large number of varieties and strains of wheat, to determine their resistance to hessian fly attack, have been conducted in California, Kansas, and Indiana, with the result that a few varieties have been found to be practically immune. It has been definitely determined that this characteristic is transmitted to succeeding generations. Breeding work is in active progress, in cooperation with the Bureau of Plant Industry in all three States, in an attempt to develop strains of wheat that will have satisfactory agronomic qualities for the various areas and also the fly-resistant quality. A technic for artificial infestation with the fly has been developed which will greatly speed up the process of selection, particularly in the areas where hessian fly outbreaks are sporadic.

It has been proven that little barley (*Hordeum pusillum* Nutt.), a common and widely distributed wheat-field grass, and other wild grasses are commonly infested with the hessian fly and may serve as reservoirs of infestation for wheat.

A number of native parasites of the hessian fly have been distributed during the year to areas in which they were not previously established, and one European species was introduced.

HAIRY VETCH BRUCHID — *Bruchus brachialis*

A serious pest of the vetches has gained a firm foothold in the Atlantic States. This has been called the hairy vetch bruchid, but it also infests the smooth varieties of vetch as well as other closely related plants. This insect is a native of Europe and was first discovered in this country at Haddon Heights, N. J., in 1931. It is now known to be present in Delaware, Maryland, Pennsylvania, Virginia, North Carolina, and South Carolina. In North Carolina it has been found in 15 counties, and in the summer of 1935 it was estimated to have damaged the vetch seed crop in part of this area to the extent of 50 percent. In South Carolina only two counties are yet known to be infested.

This pest lays its eggs on the immature pods, and the grubs burrow into the seed, where they mature. Usually the adults emerge from the seeds shortly after harvest, but individuals are sometimes imprisoned in unopened pods indefinitely, and it is believed that the insect may have been introduced into the United States in this way. The pest is unable to reinfest vetch seed in storage but is dependent upon the growing crop for its perpetuation. Its life history is being carefully studied and is now fairly well known, except the location in which the adults spend the winter.

ADDITIONAL INSECT VECTORS OF STEWART'S DISEASE

The search for vectors of Stewart's disease of corn, other than the corn flea beetle (*Chaetocnema pulicaria* Melsh.), already known to carry the disease over winter, has been continued during the year. The disease has been cultured from two additional species of beetles, namely, *Chaetocnema denticulata* Ill., a flea beetle already suspected as a vector, and *Stilbus apicalis* Melsh., apparently a pollen feeder on corn.

These cultures were made from individuals collected in the field in Virginia, in April before corn was planted, and the insects apparently had carried the infection over winter.

CORN EARWORM

The summer of 1934 was marked by one of the most severe and general outbreaks of the corn earworm ever recorded. From Ohio on the east to Iowa and Nebraska on the west and from Minnesota southward to Arkansas the insect wreaked havoc with the corn crop. In Iowa alone the loss to corn was estimated to have been at least 10 percent of the crop. Other crops, such as tomatoes, were severely injured throughout this region.

For several years limited investigations have been conducted in an effort to obtain practical control of this pest in corn. These studies have been intensified and expanded and a full program has been set up with a view to determining fundamental facts regarding the insect, including the geographic limitation of hibernation. Some 13 observation stations, located from Kansas and Nebraska eastward to the Atlantic coast and as far north as Connecticut, have been established for this purpose. At four of these stations, located in Virginia, Missouri, Indiana, and Kansas, respectively, intensive observations on all phases of the behavior of the insect are being carried on. Included in this program are investigations of resistant strains of corn, control through insecticides, and the utilization of variation in farm practice or cultural control.

INSECT PESTS AFFECTING THE MILLING INDUSTRY

During the year it was demonstrated that, contrary to common belief, the eggs and young larvae of the flour beetles pass unharmed through the milling process. This indicates that infested grain and infested clear and low-grade flours fed into the product for blending constitute the most important sources of infestation for flour in the mills.

The relative efficiency of the several standard fumigants used to protect stored grain has been determined. The perfection of a method of applying one of these, viz, hydrocyanic acid gas, to milling equipment has resulted in lower costs for fumigants, increased efficiency, reduced labor charges, reduction in loss of running time, and elimination of loss because of stock ordinarily removed from milling machinery and sold as stock feed.

EUROPEAN CORN BORER INSPECTION AND CERTIFICATION

Issuance during the fiscal year of 16,184 certificates for commodities requiring Federal certification to meet the requirements of State quarantines or orders on account of the European corn borer (*Pyrausta nubilalis* Hbn.) was an increase of 55 percent in the number of certificates required in the same territory during the previous fiscal year. Articles covered by these certificates had an estimated value of $186,391. This sum is 83 percent greater than last year's estimated valuation of certified commodities. With the exception of November 1934, when the number of certificates issued approximated that of the previous year, the monthly certificate requirements uniformly exceeded those of any previous month since reorganization of the Federal corn borer inspection service in January 1933. Stimulated sales of roots and plants of dahlia largely occasioned the demands for this type of inspection and certification.

State European corn borer quarantines or orders necessitating maintenance of a Federal inspection service remained unchanged during the year. Entry of likely carriers of the corn borer from infested States into Arizona, California, Colorado, Georgia, Louisiana, Nevada, Oregon, Texas, and Utah was still conditioned on Federal inspection and certification.

Few of the State quarantine orders were revised or reissued during the year. In a revision effective January 15, 1934, the Nebraska State quarantine was changed to eliminate celery, oat and rye straw, cosmos, zinnia, and hollyhock from the articles under regulation. Restrictions formerly imposed by the Nebraska quarantine on the movement of vegetable and floral plants from Indiana, Michigan, and Ohio were also eliminated. A supplement to Colorado European corn borer quarantine no. 4, effective May 1, 1935, permitted entry into Colorado until July 1, 1935, of cornstalks and fodder when sweetened and processed in hammer mills approved by inspectors of this Bureau. The State of Illinois on May 8, 1935, modified its corn-borer quarantine to permit admission into that State of green sweet corn and corn

on the ear from 28 uninfested counties in the southwestern part of Indiana. A safety zone of uninfested counties is prescribed between these excepted counties and counties which were wholly or partially under restriction prior to revocation of the Federal quarantine in 1932.

An intrastate quarantine approved by the commissioner of agriculture and immigration of Virginia on October 4, 1934, restricts the shipment of certain likely carriers of corn borer infestation from Accomac and Northampton Counties to other parts of the State. Since extensive surveys failed to locate the pest on the mainland of Virginia, the quarantine is enforced to confine the infestation to the Eastern Shore counties. Later, on November 7, 1934, the Virginia interstate quarantine was extended to include Delaware and Maryland among States designated as infested.

On June 3, 1935, the Maine quarantine on account of this insect became effective. This quarantine regulates the shipment of vegetables, plants, and cut flowers of certain types of plants originating in the New England States and shipped into the State of Maine. Shipments from Boston were the principal ones affected by this quarantine. The 1935 regulations parallel those enforced during 1934.

In States infested by the European corn borer and Japanese beetle or gypsy moth, this Federal inspection was rendered by the permanent inspection force. With the Japanese beetle and gypsy moth inspection corps already covering all corn borer infested territory in the Middle Atlantic, New England, and South Atlantic States, there remained but the eastern North Central States in which it was necessary to station inspectors assigned exclusively to corn borer certification. Inspectors in nonoverlapping territory were stationed in Detroit, Mich., Indianapolis, Ind., and Cleveland, Ohio. These three inspectors were continuously occupied by their assignment to part-time transit inspection during the shipping seasons and to Japanese beetle trap supervision in their districts during the shipping inactivity of the summer months. The time they devoted to trapping was compensated for by corn borer certification performed by Japanese beetle inspectors.

Within the Japanese beetle quarantined area demands for corn borer certification on Long Island were sufficient to warrant one inspector devoting his time exclusively to this work. Most of the establishments in this territory were uninfested by the Japanese beetle, so were entitled to beetle certificates in bulk. The volume of shipments from Long Island could not be met by an inspector making daily calls from the district Japanese beetle office in New York City. During the summer months, when shipments of dahlia tubers and other products requiring corn borer certification were at a minimum, the Long Island inspector was transferred to Japanese beetle trap supervision, and such corn borer certification as was necessary was available through the Japanese beetle organization.

Eight additional appointed personnel carried on corn borer funds were not assigned to districts on the basis of predominance of corn borer inspection work but were stationed where joint Japanese beetle and corn borer inspection formed part of the regular routine.

Supplementing routine inspection visits to New Jersey nurseries requiring Federal and State corn borer certification, careful examinations were made from September to November 1934 for corn borer infestation in 54 establishments. All State and a considerable portion of Federal corn borer certification was jointly handled in New Jersey by the regular Japanese beetle inspection force, which was maintained by allotments from these two funds. At the larger establishments from 500 to 1,000 stalks of host plants were examined. On smaller plots all stalks in the vicinity were included in the survey. Premises scouted included representative nurseries in each of the 21 counties in the State. In the northern section of the State only one establishment, in Bergen County, was found to harbor an infestation. Each of six nurseries scouted in Monmouth County was found infested. Dissection of stalks of field and sweet corn grown on or near these premises showed from 8 to 63 infested stalks in 100 stalks examined at each location. Larval population ranged from 1.2 to 2.6 larvae per infested stalk. Nurseries scouted in counties bordering the Delaware River were all found free from infestation. Four out of six nursery premises scouted in Atlantic County evidenced from 28 to 68 percent stalk infestation with a rather uniform average of 1.55 larvae per infested stalk. An additional nursery in Atlantic County and one in Cape May County on further inspection beyond the usual count of 100 stalks showed slight infestations. Information acquired in this survey was used as a basis for the issuance of

certificates to uninfested establishments during the fall of 1934 and until April 15 of the spring of 1935. For the purpose of obtaining infestation data in areas of the State from which oat and rye straw is certified, additional counts and inspections were made in the northern and western sections of the State for possible infestation spread and population increases.

Stubble counts for corn borer infestation were made in the less populous sections of Long Island by the inspector stationed in that district. In thoroughly canvassing the island late in the fall, there were examined 5 fields in each section and 125 stubbles in each field. Observations in connection with the survey showed that many of the farmers in 1934 cut their corn stubble at the ground level in accordance with good corn borer control practice. This was particularly apparent where sandy soil had been well cultivated during the growing season. Not much corn is grown on the eastern end of Long Island, so it was with difficulty that the inspector located cornfields there for counts of infested stubble. Nevertheless borers were quite evident in many fields. The survey extended to 26 localities and included counts in 51 fields, with a total acreage of 307 acres. Infestations found in Nassau County ranged from 2.4 to 52 percent, most of the stubble showing approximately 30-percent infestation. The highest infestation was found in a 4-acre field of sweet corn at Jericho. In Suffolk County negative counts were made at West Islip and Lake Grove, with other points showing infestations ranging from 0.8 to 43.2 percent. Infestation in this county is apparently heavier in the northern section than in the southern townships. At Southampton, the easternmost point to which the survey extended, 2 fields examined showed respective infestations of 15.2 and 21.6 percent. Fields of dahlias examined as a part of the corn borer inspection of dahlia roots disclosed further heavy infestations of the borer. One field in particular at Quoque, on the eastern end of the island, showed an especially heavy stalk infestation. As many as 11 borers were taken from a medium-sized plant.

Degrees of corn borer infestation in heavily infested sections of Connecticut were determined by four scouts employed by the State Agricultural Experiment Station. It was found that the infestation in the State equaled or exceeded that of 1933. Some fields evidenced 100-percent infestation. In the New Haven area inspection of one shipment of beets to comply with the Maine corn borer quarantine disclosed heavy infestation in the tops, resulting in refusal of certification. This condition was reported as rather general in that section of the State. Corn borer destruction of sweet corn was somewhat general throughout the State, causing the growers considerable loss. Prices of roasting ears harvested from infested fields were so low that some farmers plowed under their crop rather than harvest it at a loss. Local sweet corn shipped into the Boston market was more heavily infested with the corn borer than for several years past. A prominent Vermont canning factory appealed to its corn growers to practice corn borer control to insure the quality of their crop. Stalk infestation as high as 50 percent was observed by State nursery inspectors scouting on the Eastern Shore of Virginia. The borer was found generally established in Accomac and Northampton Counties, from the Maryland line south to Cheriton. Completion of a preliminary survey of infested territory in Pennsylvania by entomologists of the State showed that there were fewer borers in the northwestern sections than in 1933. An increased infestation was observed in most of the recently infested counties in the central and east-central sections. Investigations in the oldest and most heavily infested areas, in Erie and Crawford Counties, showed a continued decrease in borer population.

BLACK STEM RUST QUARANTINE ENFORCEMENT

The quarantine on account of the black stem rust of grains (*Puccinia graminis*) regulates the interstate movement of barberry and *Mahonia* plants, except *Berberis thunbergii*, the Japanese barberry, and its rust-immune varieties. These regulations provide that nurserymen who grow only rust-resistant species, as determined by inspection, may be granted permits for shipping to the grain-growing States of Colorado, Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin, and Wyoming. Such action is in support of the campaign waged for several years by the Department and the above States in destroying those barberries that spread the rust. Applications of 23 growers and 1 dealer were approved during the year, authorizing shipments under these regulations. Thirty ship-

ments in apparent violation of the quarantine were intercepted by transit inspectors during the fiscal year and returned to shippers. Of these, 24 were found on investigation to be noncommercial shipments by persons unaware of the regulations.

Berberis mentorensis Ames (MS), a new hybrid of *Berberis* covered by Plant Patent No. 99, was added to the list of species determined as resistant to the rust, making a total of 27 species that may be shipped under permit. The Bureau has available for distribution lists showing (1) *B. thunbergii* and its rust-immune horticultural varieties, which may be moved interstate without permit; (2) *Berberis* and *Mahonia* species or varieties sufficiently resistant to black stem rust for shipment into protected States; (3) *Berberis*, *Mahonia*, and *Mahoberberis* species or varieties which are susceptible to attack by black stem rust and which may not be moved into protected States; and (4) species or varieties of *Berberis* or *Mahonia* for which reaction to black stem rust attack has not been determined and which therefore may not be moved to protected States at least until their susceptibility to rust attack has been determined.

Cuttings of *Mahonia* for decorative purposes only, including hollygrape (Oregon grape), were removed from restrictions under a modification of the quarantine which became effective on February 20, 1935. The native species growing in the Northwestern States, and much used for decoration, have been determined as resistant to the disease.

BARBERRY ERADICATION

Approximately 18,900 square miles of territory in the North Central grain-growing States was surveyed for common barberry bushes during the fiscal year, resulting in the eradication of more than 570,000 bushes on 6,039 different properties. This work was a continuation of the public-works program for the prevention of stem rust undertaken in August 1933. Men employed to conduct the field work were obtained through the local reemployment offices, in accordance with the rules and regulations approved by the Public Works Administration.

ORGANIZATION

Fifteen States cooperated with the United States Department of Agriculture in the barberry-eradication program during the fiscal year. The work was conducted as a Federal project, with responsibility for general supervision resting with the Department. Because of the seasonal nature of the work, the permanent field personnel has been restricted almost entirely to a leader in charge and one clerk in each State. During the active field season approximately 120 trained men were employed to supervise the work of laborers obtained through the reemployment offices. During the winter months, when weather conditions prevented field survey, a few trained men were retained to assist with the general informational program.

SURVEY AND ERADICATION

Eradication activities were centered in areas where bushes were known to be numerous and where local inexperienced men could be employed effectively. Crews consisting of from 6 to 10 men were supervised by foremen with previous training and experience in eradication procedure. The survey under way on July 1 was continued late into December before weather conditions made further work of this type impracticable. Employing local men has proved effective, particularly in areas where bushes were numerous.

There are parts of Illinois, Minnesota, Wisconsin, Colorado, Iowa, Ohio, Indiana, and Michigan where barberries are plentiful, particularly along rivers and on other rough uncultivated lands. In some instances it was found necessary to survey entire counties intensively in order to establish boundaries of barberry infestations and bring them under control.

On the other hand, in a few of the western States of the area, including the Dakotas, Montana, Wyoming, and Nebraska, the future problem is largely a clean-up, although the few bushes remaining in these important wheat-growing States constitute not only a continuous rust hazard but a source of further spread. The final clean-up of these scattered bushes is an important part of the control program.

Table 15 summarizes (by States) the eradication data for the fiscal year.

TABLE 15.—*Progress in barberry eradication by States, fiscal year 1934–35*

State	Total properties cleared of bushes	Total barberries destroyed	Territory covered	Men employed	Employment, P. W. A.
	Number	*Number*	*Square miles*	*Number*	*Man-hours*
Colorado	95	23,696	484	48	12,069
Illinois	1,033	16,204	4,430	269	48,126
Indiana	133	3,037	359	39	12,031
Iowa	872	22,717	2,537	205	61,952
Michigan	1,182	113,981	622	135	39,750
Minnesota	232	4,983	343	76	24,825
Missouri	102	3,626	2,860	32	3,938
Montana	15	1,216	284	12	4,697
Nebraska	40	140	801	93	16,887
North Dakota	11	330	557	48	6,218
Ohio	1,026	137,009	1,836	118	45,659
South Dakota	26	142	434	22	8,171
Wisconsin	1,229	60,405	2,987	120	108,402
Wyoming	2	7	358	26	5,413
Virginia	41	187,863	30	[1] 14	[1] 729
Total	6,039	575,356	18,922	1,257	398,867

[1] 40 additional men were given 2,486 man-hours of employment in connection with the barberry-eradication program by the Virginia Emergency Relief Administration.

Common salt was most generally used for eradication during the year. Less than 1 percent of the barberry bushes were found to survive proper treatment with salt. From 10 to 15 pounds is the recommended application for a bush from 4 to 6 feet high. Bushes are dug only where the salt treatment would endanger nearby trees and shrubbery.

Sodium chlorate alone or mixed with sodium chloride proved an effective killing agent when applied as a spray and drench, particularly in connection with eradication of native barberries (*Berberis canadensis*) in southwestern Virginia. A gallon of the solution (containing 2 pounds of chemical) was found sufficient to cover 40 square feet of ground surface. Other chemicals used experimentally have not proved as effective, economical, readily available, and safe to handle as common salt.

INFORMATIONAL ACTIVITIES

The various informational activities constituted an important part of the preeradication work during the year and included demonstrations at local, county, and State fairs, news articles in local papers, illustrated talks before rural and urban school groups, and the distribution of illustrated pamphlets, lesson plans, and circular letters.

During the year school children reported a total of 689 properties on which barberries were growing, resulting in the eradication of more than 18,000 bushes. The interests of school children and adults have been encouraged through a carefully organized educational program in each of the States. As a regular part of the field program during the year, brief illustrated talks were given before 5,933 schools in 70 counties. Results of this work by States are shown in table 16.

TABLE 16.—*Results of informational work by States, fiscal year 1935*

State	Counties covered on school work	Barberry locations reported	Barberries destroyed as result of reports	People reached through informational activities	State	Counties covered on school work	Barberry locations reported	Barberries destroyed as result of reports	People reached through informational activities
	Number	*Number*	*Number*	*Number*		*Number*	*Number*	*Number*	*Number*
Colorado	8	4	56	3,835	North Dakota	7	2	2	13,488
Illinois	6	79	674	15,591	Ohio	0	67	2,322	----
Indiana	5	30	108	113,800	South Dakota	6	4	13	18,587
Iowa	10	175	0	26,855	Wisconsin	1	43	394	2,753
Michigan	4	189	14,030	86,306	Wyoming	5	2	3	5,744
Minnesota	2	66	179	10,003					
Montana	8	11	342	25,000	Total	70	689	[1] 18,140	337,282
Nebraska	8	17	17	15,320					

[1] This figure represents bushes destroyed on properties actually reported by children. Often the report of 1 bush is indirectly responsible for the eradication of many in the surrounding territory.

RUST SURVEYS

Except in certain localities in Minnesota and North Dakota, the 1934 losses from stem rust in the spring-wheat area were very slight. During the spring barberries became infected earlier than usual and a considerable number of local epidemics of rust developed near them, but high temperatures, together with the drought, prevented a damaging spread of the fungus, except in those localities where there were frequent dews or showers. The uredinial stage of stem rust of wheat did not survive the winter of 1933–34 as commonly in Texas as in some other years. There was, however, considerable overwintering on oats.

Seven hundred and eighty-two rust specimens collected in 1934 were identified as to the physiologic forms present. The most surprising result of this work was the fact that form 56, heretofore unimportant and not wide-spread, constituted 30 percent of the total number of collections identified, whereas form 34, which also had been relatively rare, constituted 20 percent of the total. A different form was obtained from each three collections from barberry bushes, while a different form was found in each 35 collections of rust obtained from grain plants away from barberries, further indicating that the bushes are an important factor in the persistence of physiologic forms and the production of new ones.

During the winter of 1934–35 the uredinial stage of stem rust of wheat overwintered rather abundantly in Texas but little was found on oats. Because of a large acreage of late wheat in Kansas and Nebraska, rust developed far more abundantly in those States in the spring of 1935 than is usually the case. Frequent rains and favorable temperature contributed to the rapid spread of the fungus. The generally cool, wet weather during May and the first half of June resulted in heavy stands and a succulent growth of grains in the spring-wheat area. The crops were from a week to 10 days, and in some instances 2 weeks late, with other conditions ideal for the development of rust. Strong south winds on June 23 and 24 carried an enormous number of spores from Kansas and Nebraska into the spring-wheat area. On June 23 spores caught on vaselined slides at St. Paul indicated that they were falling at the rate of 1,000 per square foot each in 24 hours. As a result of weather conditions favorable for the spread of the rust, combined with other circumstances described, the most wide-spread epidemic of wheat stem rust in recent years occurred in the summer of 1935.

Although some local rust epidemics developed on rye and other grains near barberry bushes there was relatively little rust on oats and rye away from bushes, further indicating that wind-blown inoculum was the important factor contributing to the extensive damage to wheat this year. Had barberry bushes been numerous in the Dakotas and Minnesota it is evident that oats, rye, and barley would not have escaped serious damage.

CLASSIFICATION OF BARBERRIES

Approximately 140 different species, varieties, and hybrids of barberries have been obtained from the Arnold Arboretum and nurseries throughout the United States and planted in an experimental plot at Bell, Md. During the fall of 1934 and again in the spring of 1935 tests were continued to determine the rust susceptibility of the individual species. The outdoor test confirmed data obtained heretofore under controlled conditions. In determining the reaction of barberries to the different varieties of stem rust in the greenhouses at St. Paul, a number of rust crosses were made and considerable evidence was obtained that in nature unusual forms may result from such crossing.

During the past year 27 nurseries requesting permits to ship species of barberry other than Japanese were inspected, in keeping with the provisions contained in Quarantine No. 38 (revised). Certificates to the nurseries that qualified were issued by the Division of Domestic Plant Quarantines.

TRUCK CROP AND GARDEN INSECT INVESTIGATIONS

WIREWORMS

Investigations on the control of wireworms in the irrigated areas of the West have been continued, the measures tested including soil fumigation with naphthalene, flooding at a period when the air temperatures are high, drying out of the soil, trapping of adults, and crop rotation. The work on the sandy land wireworm in South Carolina has been completed, and these investigations show

that losses from this pest can be reduced by proper fertilization, crop rotation, and early planting. Where an abundance of land is available the noncultivation of land for one season will also aid materially in reducing wireworm populations.

The Gulf wireworm (*Heteroderes laurentii* Guer.) is becoming of greater importance each year in the Gulf region and on the Coastal Plain. This wireworm is likely to be more abundant in land that has been tilled year after year than in untilled land.

BEAN AND PEA INSECTS

The Mexican bean beetle continues to be the most important pest of beans in the United States, and while the winter survival for 1934–35 was lower in Ohio than it had been for several years, with favorable spring conditions the beetle populations built up to the point where the insect caused considerable damage. Both field and laboratory tests of many types of insecticides have been conducted in Ohio and Virginia. The work with insecticides showed quite conclusively that derris powder mixed with water and applied as a spray gave exceptionally good control of the bean beetle, both in Ohio and Virginia. Cryolite also was effective. For some unexplained reason, the dosage of magnesium arsenate, that is, 1 pound to 50 gallons of water, which heretofore had been effective in the control of the bean beetle has not yielded the same results during the past few seasons, and it is now necessary to use 2 pounds of magnesium arsenate to 50 gallons of water in order to bring about the same results. This high dosage may result in some injury to the bean foliage.

With the establishment of pea-canning factories in the Northwest, the control of the pea weevil has increased in importance. The utilization of a border trap crop and the plowing under of these border plantings prior to the time that the main plantings blossom have given encouraging results. During the latter part of the year this work was expanded to include studies of the weevil in the Dayton, Wash., area.

The pea aphid again caused heavy losses to the pea growers in Wisconsin, New York, and Ohio. The investigations this season consisted primarily of field-plot tests with several insecticides, and while the results to date are only of a preliminary nature and cannot be used as a basis for recommendations on pea aphid control, the indications are that a derris powder spray may be useful against the pea aphid.

BEET LEAF HOPPER

In the beet-growing area of southern Idaho the early-season indications were that heavy leaf hopper populations could be expected. The early-season prospects were borne out by large numbers of leaf hoppers appearing in the beet fields late in the spring. In California, studies on the migration of the leaf hopper and its desert host plants have been continued. Observations have also been continued on the effect of spraying desert hosts and the elimination of Russian-thistle on leaf hopper populations. The actual operation of these two latter activities was conducted by the sugar companies and the State workers.

An added feature of the leaf hopper work was the outlining of the critical breeding areas of the leaf hopper in southern Idaho. This work had for its objective the possibility of controlling weeds in the abandoned land and desert areas through proper land handling as a means of reducing leaf hopper populations. Evidence accumulated indicates that native grasses which are not hosts of the leaf hopper will replace the introduced weed hosts in the large breeding areas if given an opportunity. Similar studies have been carried on in Utah and Colorado; however, the areas involved here are much larger than in southern Idaho, and consequently the information regarding the critical breeding areas of the leaf hopper in these two States has not been as complete as for southern Idaho.

TOBACCO INSECTS

Derris powder has shown excellent promise as a control for the tobacco flea beetle, especially in the seed beds. Similar control has been secured in the field, but the cost of such treatments has not been determined. Barium fluosilicate, heretofore reported as useful in the control of flea beetles in the shade-grown tobacco areas of Quincy, Fla., has not proved satisfactory during the past season, as it may cause considerable injury to the tobacco plant. Cryolite,

while effective against the flea beetle, also under certain conditions produces injury to the tobacco plants.

Many materials have been tested as substitutes for lead arsenate and paris green for the control of the tobacco hornworm, but as yet no promising material has been found.

The work on stored-tobacco pests has been directed primarily to the use of a light trap in warehouses, combined with fumigation. In control tests these measures have effected a very decided reduction in the amount of stored tobacco destroyed by the cigarette beetle and the tobacco moth.

BERRY INSECTS

Investigations of berry insects have consisted mainly of a study of the control of the raspberry fruitworm and the red berry mite in the Puyallup Valley of Washington. Control tests have been conducted against the strawberry weevil at Chadbourn, N. C., to develop insecticide treatments and cultural control measures that will avoid the presence of objectionable residues on the berry at harvest time. The strawberry crop on the Coastal Plain develops fruit rather slowly in some seasons and oftentimes it is necessary to treat the crop to prevent damage from the strawberry weevil when there are large green berries on the plant. The use of an arsenical at such a period would leave an objectionable residue on the berry at harvest. The results of these tests were inconclusive.

STUDIES OF NONARSENICAL INSECTICIDES

Laboratory experiments and large field-plot tests to determine the relative toxicity of pyrethrum and derris mixtures for the control of several species of cabbage worms have been carried on at several laboratories. The field-plot tests on cabbage have shown definitely that derris dust mixtures containing from 0.5 to 1 percent of rotenone are effective against the common cabbage worm, less effective against the cabbage looper, and still less effective against the diamond-back moth. The indications, nevertheless, are that derris powder will be a useful material in the control of all three species of these cabbage pests. In general pyrethrum dust mixtures were less effective than those of derris against all three species. An outstanding feature of the laboratory toxicity tests is the different action of derris on the insects tested. For example, the celery leaf tier is not affected by derris powder; the semitropical army worm, while repelled by derris, is not otherwise affected; the common cabbage worm, on the other hand, readily succumbs to derris powder.

MISCELLANEOUS VEGETABLE INSECTS

Fumigation of sweetpotatoes (to be used for seed purposes) with paradichlorobenzene has yielded some very promising results.

In California the cleaning up of nightshade, the winter host plant of the pepper weevil, has proved to be of value in reducing injury from this pest.

Experiments on the turnip aphid in Louisiana indicate that derris dust may satisfactorily protect the turnip crop from damage.

GREENHOUSE AND BULB INSECTS

Tests to determine the value of hot water for the control of mites show that delphinium, gerbera, and cyclamen, as well as vigorous cuttings of certain varieties of chrysanthemum, may be successfully treated without plant injury, and that other varieties will suffer slight to moderate injury but will recover satisfactorily.

Experiments with hot water for the control of the iris thrips show that the Japanese iris may be effectively treated either in the spring or fall, but that fall treatment is preferable.

The Mexican mealybug became an important pest in several greenhouses in the Eastern States and the control work showed that this pest is susceptible to fumigation with hydrocyanic acid gas.

It has been definitely shown that fumigation of gladiolus corms with napthalene toward the end of the storage period, for the control of the gladiolus thrips, will result in a decided retardation of the growth of the corm and in some instances may prevent germination. The gladiolus thrips has continued as a pest of gladiolus and has been reported from practically the entire United States.

MUSHROOM INSECTS

In the investigation on mushroom pests special emphasis has been placed on possible use of napthalene and paradichlorobenzene. Chemists of the Division of Insecticide Investigations have been associated with these studies.

QUARANTINE ON DOMESTIC NARCISSUS

The narcissus-bulb quarantine was revoked, effective April 1, 1935. This action was taken because attempts at general eradication of the eelworm and the greater bulb fly had not been successful, the pests occurring year after year in most areas where such attempts had been made. Furthermore, both these pests have become established in commercial bulb plantings in many States in addition to those in which they were known to occur in 1926, when the quarantine was established.

The removal of the Federal quarantine left the interested States free to act in placing such restrictions as they deemed advisable. The State of Oregon thereupon issued a quarantine on the entry of narcissus bulbs, with inspection and fumigation requirements similar to those formerly in effect under the Federal quarantine. State officers of Florida, Virginia, Pennsylvania, Michigan, and Texas announced that inspections of narcissus would be made the same as when the Federal requirements were in effect, and Maryland officers announced their intention of continuing inspection of these bulbs as part of the general nursery-inspection program.

For the season of 1934 the State nursery inspectors in 27 States reported to the Bureau the inspection of 235,486,085 narcissus bulbs. Detailed information on the number of plantings and bulbs and the extent of treatment in the individual States is given in Circular B. E. P. Q.–373, issued on April 23, 1935.

From July 1, 1934, to April 1, 1935, 154 violations of the quarantine were intercepted at transit-inspection points.

COTTON INSECT INVESTIGATIONS

The issuance of information on the distribution and abundance of insects attacking cotton, together with timely advice on methods for their control, was resumed during the year. Reports about cotton insects were included in the Insect Pest Survey Bulletin and in press releases and radio broadcasts along the same general lines followed with insect pests of other crops.

BOLLWEEVIL

The initial bollweevil infestation in the crop season of 1934 at Tallulah, La., was comparatively high, but the hot, dry weather from June 18 to the end of August held the weevils in check. Experimental plots dusted with calcium arsenate following standard recommendations gave an average increase of only 236 pounds of seed cotton per acre, or 19.5 percent, as compared to 419 pounds, or 45.4 percent, during the previous year.

A large series of field and cage tests were conducted to determine the efficacy of a number of insecticides, mixtures of insecticides, and insecticides diluted with carriers. The tests at Tallulah showed the value of several other materials for bollweevil control, but none was found to be superior to calcium arsenate dust. Mixtures of calcium arsenate and hydrated lime, mixtures of paris green and lime, and a mixture of calcium arsenate and copper arsenite gave good results. These preliminary results suggest that these materials may be useful for regions where it may be desirable to reduce the amount of arsenic used or when other insects, such as the cotton flea hopper and cotton leaf worm, must be controlled along with the bollweevil. Tests with thiodiphenylamine (phenothiazine) and sulphur, and with derris root in inert carriers, indicate that these may have a place among effective nonarsenical poisons. Tests conducted to compare the results from dusting with calcium arsenate early in the morning, at midday, and late in the evening were favorable to the early morning applications; and tests to compare the results of dusting at 4-, 6-, and 8-day intervals were favorable to the 4-day program.

For the third year in succession, in tests at Florence, S. C., a mixture of equal parts of hydrated lime and calcium arsenate was as satisfactory for the control of the bollweevil as calcium arsenate alone when each was used at the rate of about 7 pounds per acre per application. Other mixtures of lime with calcium arsenate and with paris green gave good results.

The fourth annual application of calcium arsenate to the soil, at the rate of 400 pounds per acre, was applied on a plot at Tallulah, making a total of 1,600 pounds applied. The average yield of seed cotton per acre for 1934 from the treated plot was 1,701 pounds and from the untreated check plot, 1,744 pounds, a difference of 43 pounds or 2.5 percent. In 1931 and 1932 the treated plot yielded more than the untreated plot, while in 1933 and 1934 the plot with the calcium arsenate yielded less. These yield records indicate that excessive applications of calcium arsenate do not affect the yield of cotton on the particular type of alluvial sandy loam soil near Tallulah. During 1934 velvetbeans grew normally on the treated plot but soybeans and cowpeas soon died.

That a bollweevil may occasionally live for an entire year was again demonstrated at Tallulah in 1934. One weevil placed in a hibernation cage on November 16, 1933, was last observed 360 days later on November 10, 1934. Another weevil placed in a hibernation cage on November 1, 1933, was observed 377 days later on November 12, 1934. The weevils used in these tests were given special care during the summer of 1934 and were again placed in hibernation cages in the fall. They died during the following winter.

PINK BOLLWORM

Extensive releases of the parasites *Exeristes roborator* Fab. and *Microbracon brevicornis* Wesm. indicate they are not adapted to conditions in Texas and Mexico where the pink bollworm occurs. Although these insects readily parasitize the pink bollworm, *E. roborator* emerges too early in the spring and *M. brevicornis* does not survive the winters. Four other species of parasites are now being bred for releasing as follows: *Microbracon kirkpatricki* Walk., received from Egypt where it had been imported from east-central Africa; *Elasmus* sp., introduced from Egypt; *Microbracon mellitor* Say, introduced from Hawaii; and *Chelonus blackburni* Busck, introduced from Hawaii.

Studies are under way to determine the resistance of different varieties of cotton to pink bollworm attack, the characters causing resistance, and the influence of different cultural and climatic factors on these characters. Observations at Tlahualilo, Durango, Mexico, indicate that the pink bollworm has a preference for bolls between the ages of 36 and 41 days from the date of blooming. As the infestation becomes heavier the preference is less marked and bolls of all ages are infested. Studies of pink bollworm damage in the vicinity of Tlahualilo showed that the reduction in yield of seed cotton, the reduction in grade of lint, and the damage to the seed caused a loss to the crop of $22.97 per acre.

COTTON FLEA HOPPER

The results of tests at Port Lavaca, Tex., during two seasons show that the average increase in seed cotton per acre in the plots treated for the cotton flea hopper was 230 pounds with a net profit of $9.75 in 1933 and 306 pounds with a net profit of $12.66 in 1934. In a series of 336 cage tests in which 15,566 cotton flea hoppers were used in the summer of 1934 for testing 35 insecticides, the best results were obtained from a mixture of 1 part of paris green with 10 parts of sulphur. The heavy migration of flea hoppers to cotton occurred during the first week of June in 1935, which was approximately 3 weeks later than in 1934. Sticky screens used to catch flea hoppers showed that there is considerable movement of the hoppers in the spring at least 24 feet in the air, and that more are collected on the leeward side of the screen. Ninety-nine and eight-tenths percent of the cotton flea hoppers emerged from croton, the principal overwintering host plant. Other plants from which the other 0.2 percent of the hoppers emerged were cotton bitterweed, cocklebur, and bloodweed. Nine generations of hoppers occurred at Port Lavaca during 1934.

APHIDS ATTACKING COTTON ROOTS

Certain aphids attacking roots of cotton kill or seriously injure young plants, particularly along the Atlantic Coastal Plain, and studies have been begun at Florence, S. C., to develop control measures for them, especially *Anuraphis maidi-radicis* Forbes, *Trifidaphis phascoli* Pass., and *Rhopalosiphum* sp. The first species causes serious injury to young cotton in North Carolina, South Carolina, Georgia, and Virginia, while the other two species have been reported only from the Carolinas.

PINK BOLLWORM CONTROL

The outstanding developments of the year in the pink bollworm situation were the finding of infestation in several additional counties in northern Florida and western Texas, no recurrence of the insect in the original infested areas of Florida and Georgia, and continued progress in the eradication of wild cotton in southern Florida and in the special control program in the Big Bend of Texas.

The new findings involved 7 counties in Florida and 3 in western Texas. The fact that only 20 specimens were found in these 10 counties indicates that the infestations are extremely light. As mentioned in a previous report, the discovery of such light infestations is due to improved methods of inspection, particularly to the use of the gin-trash machine.

NEW INFESTATION IN FLORIDA

On September 3, 1934, one larva of the pink bollworm was found in gin trash at Bascom in Jackson County. Jackson is the largest cotton-producing county in Florida. Additional gin-trash machines were sent to the area, and practically all trash in the county was inspected during the remainder of the season. As a result, seven additional specimens were taken at Bascom, and on September 26 a specimen was found in trash at Cottondale, also in Jackson County. Nearly 2,000 bushels of trash was inspected in this county; consequently, the finding of only nine specimens indicates that the infestation was very light. The other findings in Florida were in Suwannee, Levy, and Hamilton Counties, near the regulated area, and involved 3 additional counties, Dixie, Lafayette, and Taylor, which had no ginning facilities. Only seven specimens were found, indicating that the infestation is also very light in these counties.

The Federal quarantine was immediately extended to take in the infested areas but, as the season was well advanced, it was impossible to obtain and install the necessary equipment for carrying out all of the regulations. The measures taken to prevent the spread of the insect consisted in sending the seed to designated mills, the compression of lint, the disposal of gin trash, and the clean-up of gins after the close of the season's operations. At the close of the fiscal year the ginners were making plans to install sterilizing equipment so as to carry out the regulations in full during the coming season.

WILD COTTON IN SOUTHERN FLORIDA

The eradication of wild cotton in southern Florida was begun in 1932 to eliminate a severe pink bollworm infestation and has been continued each successive year. Because of climatic conditions, this work can be carried on only during the fall, winter, and early spring.

Eradication activities were resumed about the first of November, and, owing to a very dry season, especially good progress was made. All of the areas cleaned during previous seasons were again recleaned. During this recleaning intensive scouting was carried on to locate any cotton that had been overlooked, and a number of scattered plants and small colonies were found and removed. At Cape Sable, where most of the wild cotton is now located, a considerable area was cleaned for the first time, and in addition all of the area previously cleaned was covered. Many of the islands and keys in Florida Bay were also cleaned. During the season a first clean-up was made covering 908½ acres, from which 76,920 mature and 58,404 seedling plants were removed. From the area recleaned 6,463 mature, 1,666,621 seedling, and 150,477 sprout plants were removed. This might at first appear to be an unusually large number of mature plants to have been found on areas previously cleaned. As the inspectors had had 2 years' experience with wild cotton, they had naturally become more familiar with the various conditions under which it grows, and during the past year they were able to locate many plants that had been overlooked, as shown by the large number removed. Most of these occurred in the Cape Sable area. Because of the importance of maintaining as great a distance as possible between the cultivated and the wild cotton, the seven most northerly counties along the west coast where wild cotton occurs were gone over after the regular clean-up work was discontinued. This was done to remove the seedlings that had come up and thus prevent their fruiting before work can be resumed next fall. It is very encouraging to note that during

each recleaning a much smaller number of plants is encountered, indicating that progress is being made. A number of locations where wild cotton previously occurred were found to be entirely free of plants this last season.

When the eradication of wild cotton was first begun many plants were found growing in almost solid rock on some of the keys. The removal of these plants without breaking off some of the roots, which would put out sprout plants, appeared to be quite a problem, and some experiments were begun to determine the practicability of destroying wild cotton with poison. Excellent results were obtained, therefore the poisoning method was used throughout the past season. As the poisoning treatment alone is rather expensive, however, it has been used only where the plants were growing in rocky places.

Mention has been made in previous reports of the small experimental plantings of cultivated and wild cotton in the United States Plant Introduction Gardens at Chapman Field. In cooperation with the Bureau of Plant Industry, all fruit from this cotton was removed and inspected. On several different occasions specimens of the pink bollworm were found in this cotton. At the beginning of the fiscal year it was not considered worth while to maintain these plantings any longer for inspection purposes; therefore, the officials of Chapman Field moved all of the valuable plants into a screened house and destroyed the remaining ones.

CONTROL PROGRAM IN THE BIG BEND AREA OF TEXAS

The special control program begun in the Big Bend area 2 years ago was continued. This program is for the purpose of reducing the heavy infestation and thereby lessening the danger of the spread of the pest to the main Cotton Belt. The measures consist of thorough clean-up of fields and premises, after picking is completed, delayed planting the following spring, and the use of small plots of cotton to trap the late-emerging moths. In the spring of 1934, 28 trap plots were used, and these were continued until about the first of August, at which time the field cotton had reached approximately the same size and fruiting stage. The blooms were collected daily and worms had been found in all but 3 of the plots; in only 5 of these, however, was the infestation over 1 percent. At the time the plots were discontinued infestation had been found in 13 adjacent fields, and in only 1 field was the infestation over 1 percent. This indicated that the infestation was building up very slowly. No regular gin-trash inspections were made, but during September a few incidental inspections were made as time permitted. On September 10, 6,891 larvae were taken from the trash of 17 bales; on September 17, trash from 10 bales contained 925 worms; on September 23, trash from 17 bales contained 9,363 worms; and on October 8, trash from 12 bales contained 9,862 worms. It will be noted from the foregoing figures that the average number of worms per bale ranged from about 90 to a little aver 800. The first cotton from a farm contained about 136 worms per bale in 1933 and 1,160 in 1932. Another farm had an average of about 336 worms from the first cotton in 1933 and 922 in 1932. As the inspections made during the year under discussion were about a month later than those made in 1933 and 1932, no accurate comparisons can be made; it will be noted, however, that the number is much smaller than in 1932. Even though a rather large number of worms was found in the 1934 crop, there was very little, if any, field damage; in fact, for the first time since the pink bollworm became established in the Big Bend the farmers were able to pick cotton from the top crop of bolls.

Field clean-up was begun on October 18, but it was about the first of December before very much headway could be made. This was due to the fact that the top crop of bolls produced cotton, and consequently delayed the completion of picking. The most heavily infested fields had been cleaned before the end of November, and all clean-up was completed on January 12. A total of 3,891 acres was cleaned at an average cost of $4.12 per acre for labor and equipment. This is an increase in the cost of cleaning over the 2 previous years and is due partly to the fact that cotton began opening much earlier than usual. Consequently, the farmers immediately began picking and gave the fields no further cultivation, with the result that a considerable amount of weeds and grass was produced, making clean-up more difficult. The principal reason for the increase, however, was the fact that it was necessary to pay laborers a higher wage than during the previous two clean-ups. The field clean-up was followed by a house-to-house canvass, and only three lots of seed cotton, totaling 125 pounds, were found. This was all destroyed with the consent of the owners.

Trap plots were used again in the spring of 1935. The cotton was planted in the field, instead of being grown in hotbeds, and later transplanted, as was the case during the two previous seasons. The plots ranged in size from one-fourth to one-half acre. Owing to unfavorable weather, the cotton did not begin growing as fast as was expected, but weather conditions also delayed the field cotton, and the trap cotton began blooming at least a month in advance of the field cotton. Bloom collections were begun on May 20, and within a few days infestation was found in several of the plots. At the end of the fiscal year infestation had been found in all 13 plots, and a much larger number of worms is being found this year than last. This may be owing to a difference in the emergence of moths each year. On the other hand, it may be because the field clean-up was a little later this year, on account of the top crop mentioned above. If so, it indicates very clearly that the earlier the fields can be cleaned each fall the fewer moths there will be the following spring, as worms will have less time to enter the soil for hibernation. The delayed planting date of April 15 was satisfactorily observed. Field cotton in Brewster County has just begun blooming, and a few worms have been found, but the cotton in Presidio County is considerably later, and no blooms have yet been produced.

NEW INFESTATION IN TEXAS

The new infestation in Texas involved Andrews and Ector Counties and all but a small part of Midland County. The last is not a new infestation, as this area was previously under regulation, having been released February 28, 1933. The last findings had consisted of 2 specimens in the 1931 crop. On October 18, 1934, a specimen of the pink bollworm was found in trash at Midland. This was followed by additional findings on October 23 and 24. Owing to the lack of ginning facilities, cotton produced in Andrews and Ector Counties is ginned at Midland, hence they were involved in the infestation. On October 24, 1 specimen was found in gin trash at Stanton, in Martin County. An examination of the gin records showed that most of the cotton from which the trash came had been produced in Midland County, with only a few fields from Martin County represented. Intensive inspections were made in these Martin County fields and the gin trash from the remaining cotton was caught separately and inspected without any indication of infestation being found. It seems almost certain, therefore, that the above specimen originated in Midland County, and this information did not seem to warrant including Martin County in the regulated area. Inspections were continued during the remainder of the ginning season without finding any additional specimens. It will thus be seen that, as was the case in other new areas, the infestation in this area is very light.

The three counties mentioned above were again placed under regulation, and the movement of products therefrom was handled accordingly. Inasmuch as the ginners had had previous experience with the regulations, they cooperated whole-heartedly.

CHANGE OF INSPECTION METHOD IN REGULATED AREAS

Heretofore gin-trash inspection has been made in each county under regulation to determine whether or not infestation was present, and if so to what degree. In the fall of 1933 green bolls had been collected from a number of lightly infested counties and were later inspected as a check on the laboratory method. It was demonstrated that a rather light infestation could be discovered by this method. Therefore, as an economy measure, a plan was worked out whereby a number of gin-trash crews could be eliminated and at the same time a check on the infestation condition could still be taken, although somewhat delayed. This plan is to collect green bolls in the fall in counties where infestation has existed for some time. The bolls are preserved and inspected later in the season, as regulatory activities decrease. In case no infestation is found in the bolls, gin-trash inspection is to be substituted the following season.

SITUATION IN OLDER REGULATED AREAS

Intensive gin-trash inspections were carried on in the older regulated areas of northern Florida and Georgia. In Madison County, Fla., 1 specimen of the pink bollworm was found, but in the other counties of Florida and in the three counties in Georgia the results were all negative. Intensive inspections

were also carried on in the western extension of Texas and in Lea and Roosevelt Counties, N. Mex., brought under regulation last season. In Terry County, Tex., 2 specimens were found, but the results were negative in the remaining counties. Gin-trash inspection indicated that infestation in about the same degree as last year still exists in the Safford Valley of Arizona and in the Pecos Valley of Texas. In the remaining regulated areas the new method of boll inspection has been substituted for gin-trash inspection. The examination of this material is not yet completed; however, infestation has already been established, except in Dona Ana County, N. Mex.

A summary of the various kinds of inspection, together with the number of specimens found, is shown in table 17.

TABLE 17.—*Summary of inspections for the pink bollworm in regulated areas, crop season of 1934*

District	Gin trash		Field		Laboratory	
	Bushels	Pink bollworms	Man-days	Pink bollworms	Samples	Pink bollworms
New areas:						
Jackson County, Fla.	1,848	9	3	0	0	0
Other seven counties in Florida	645	7	0	0	175	0
Midland, Tex.	761	4	0	0	66	0
Total	3,254	20	3	0	241	0
Older regulated areas:						
Pecos Valley, N. Mex.	941	6	0	0	188	13
Pecos Valley, Tex.	25	51	0	0	104	0
Big Bend, Tex.	50	27,041	0	0	23	2,480
Hudspeth County, Tex. (southeastern part)	2	1,784	0	0	44	232
El Paso Valley, Tex.	1	14	0	0	234	6
Mesilla Valley, Tex. and N. Mex.	5	3	0	0	356	0
Tularosa, N. Mex.	0	0	0	0	0	0
Deming, N. Mex.	0	0	0	0	0	0
Duncan Valley, Ariz. and N. Mex.	0	0	0	0	22	0
Safford Valley, Ariz.	2,378	20	0	0	64	0
Tucson, Ariz.	370	0	0	0	160	(1)
Northern Florida	634	1	20	0	128	0
Southern Georgia	3,073	0	0	0	49	0
Western extension, Texas and New Mexico	12,354	2	0	0	132	0
Total	19,833	28,922	20	0	1,504	2,731
Grand total	23,087	28,942	23	0	1,745	2,731

[1] Pink bollworm results negative, but 30 specimens of Thurberia weevil found.

INSPECTION OUTSIDE REGULATED AREAS

Inspections during the 1934 crop season were for the most part confined to sections immediately adjacent or close to the regulated areas, where infestations would be most likely to occur. As usual, gin-trash inspection began in the lower Rio Grande Valley of Texas, with the machines working northward as the crop advanced. Especially intensive inspections were made in those sections of Alabama and Georgia adjacent to Jackson County, Fla., where a new infestation was discovered; also near the western extension of Texas. Another area in which intensive inspections were carried on was the Salt River Valley of Arizona, which was released from the regulations the latter part of 1933. An invitation was extended by the Mexican Department of Agriculture to make gin-trash inspections in various States adjacent to the border of Texas and also in Baja California, and this was done. On the whole, the supply of trash was plentiful and other working conditions were quite satisfactory. In the Juarez Valley of Mexico, opposite the El Paso Valley of Texas, gin-trash inspections were made by hand from time to time and specimens were found. With this exception, the results of all gin-trash inspection were negative both in the United States and in Mexico. At the close of the ginning season laboratory inspection of green bolls and bollie samples, collected in the various cotton States, was begun. The results of this inspection were

also negative at the close of the fiscal year; however, there is still some material to be inspected.

A summary of the various kinds of inspection and the amount of material inspected is shown in table 18.

TABLE 18.—*Summary of inspections for the pink bollworm outside regulated areas, crop season 1934* [1]

State	Gin trash	Field	Laboratory
	Bushels	*Man-days*	*Samples*
Alabama	4,860	100	1,140
Arizona	5,341	9	30
Florida	925	11	0
Georgia	5,285	12	161
Louisiana	0	0	1,409
Mississippi	0	0	330
Oklahoma	30	0	454
Texas	14,810	58	1,123
Total	31,251	190	4,647
Mexico:			
Baja California	1,676	0	0
Chihuahua [1]	30	0	0
Coahuila	228	0	0
Nuevo Leon	632	0	0
Tamaulipas	452	0	0
Total	3,018	0	0
Grand total	34,269	190	4,647

[1] All results negative, except that 105 pink bollworms were found in the Juarez Valley of Mexico.

CHANGES IN REGULATIONS

During the fiscal year 1935 two changes were made in the pink bollworm quarantine regulations, both of which were for the purpose of including the newly infested sections.

Amendment no. 1, effective September 19, 1934, was made for the purpose of adding Jackson and Suwannee Counties, Fla., to the regulated area.

Amendment no. 2, effective October 31, 1934, was made for the purpose of adding Dixie, Hamilton, Lafayette, Levy, and Taylor Counties, Fla., and Andrews and Ector Counties, and part of Midland County, Tex., to the regulated area.

The above areas were designated as lightly infested. At present the regulated areas include 3 counties in southern Arizona, 14 in north-central Florida, parts of 3 in southern Georgia, 9 in southern New Mexico, and 17 entire counties and parts of 4 additional ones in western Texas. Of this area five counties and part of another in Texas are designated as heavily infested and all of the remaining area as lightly infested.

CONTROL AND ERADICATION MEASURES

No changes were made this past season in the measures enforced to control and prevent the spread of the pink bollworm from infested areas. These consisted of (1) disposal of gin trash, (2) sterilization of seed, (3) supervision of oil mills, (4) fumigation, compression, steaming, and roller treating of lint, (5) road stations, and (6) cooperation with Mexico.

DISPOSAL OF GIN TRASH

Most gins are equipped with cleaning machinery through which the cotton passes before entering the gin stands. A considerable amount of trash is taken from the cotton by this machinery and many pink bollworms are discharged with the trash, the number depending, of course, on the degree of infestation. The regulations require the daily disposal of this trash by burning, sterilization, or grinding. Several years ago the Texas and New Mexico regulations were amended to require the daily disposal of trash to December 1 of each year, the average killing frost date being prior to this. The ginners have always cooperated by continuing daily disposal of trash until a killing frost occurs, if it is later than December 1.

SEED STERILIZATION

The sterilization of seed is undoubtedly the most important single measure in controlling and preventing the spread of the pink bollworm. Therefore, gins within the regulated areas are equipped to heat seed to a temperature of 145° F. as a continuous process of ginning. The machinery is equipped with a thermograph so that the temperature of the seed is recorded at all times. During the past season 97 of these machines heated approximately 95,000 tons of seed. Seed heated to a temperature of 145° for 1 hour, and handled so as to prevent contamination, is permitted to move to any destination. This treatment is principally to take care of planting seed, and during the season some 8 or 10 tons of seed were so treated.

SUPERVISION OF OIL MILLS

The lack of oil mills in some sections of the regulated areas makes it necessary each year to designate outside mills to handle seed from the regulated areas. These mills are equipped with machinery to give the seed a precooking immediately upon arival. This past season 10 mills were designated, in addition to the 11 located within the area. Approximately 70,000 tons of seed were crushed. Several of the mills were equipped with rollers for treating second-cut and mill-run linters, and 12,285 bales were so treated.

FUMIGATION, COMPRESSION, STEAMING, AND ROLLER TREATMENT OF LINT

Fumigation is now listed as an optional treatment and, as a result, only three plants were operated during the season. They treated 59 bales of lint and 946 bales of linters. Of the linters treated, 361 bales had been imported from the Juarez Valley of Mexico. At the 12 compresses operating, 133,376 bales of lint and 2,604 bales of linters were treated. A number of gins have roller equipment, and 27,708 bales of lint were treated by this method. A steam-pressure machine was operated by the State of Texas at Presidio and treated 2,083 bales of lint.

ROAD STATIONS

A road inspection station was again maintained at the junction of the Presidio and Ruidosa roads 1½ miles south of Marfa, Tex. This station is operated to prevent the movement of infested material from the Big Bend area. It was opened September 1, 1934, and closed January 4, 1935, after the field clean-up had practically been completed in the Big Bend. A total of 4,122 cars was inspected, from which 44 confiscations were made. These confiscations consisted of 27 lots of seed cotton, cottonseed, and other materials, 5 pick sacks, and 6 pillows and quilts, all of which were burned, and 7 pick sacks and 1 mattress, which were treated and passed. Of the 44 confiscations made, 6 were found to be infested with the pink bollworm, 45 living and 25 dead worms being found. These worms were in small lots of seed and seed cotton taken mostly from trucks that had been hauling such products. No living worms have ever been found in seed that had been sterilized.

COOPERATION WITH MEXICO

In the Conchos and Juarez Valleys of Mexico, immediately adjacent to the Big Bend and the El Paso Valley of Texas, respectively, a considerable amount of cotton is produced which is also infested with the pink bollworm. Mexican officials are endeavoring to control the insect with measures similar to those enforced in this country, such as field clean-up, seed sterilization, and supervision of oil mills. In coordinating and carrying out these various measures there is a free interchange of visits by the Mexican officials and inspectors of this project, and a splendid spirit of cooperation has always been maintained.

THURBERIA WEEVIL CONTROL

Practically all cotton produced in the Thurberia weevil area in Arizona is grown along the Santa Cruz River Valley, extending from Nogales, on the Mexican border, northward about 100 miles, or to 30 miles above Tucson. For the past several years no cotton has been grown in the southern end of the area. This year, however, a little cotton was planted in Santa Cruz County

in the southern end, but the bulk of the crop began about 18 miles above Tucson, extending northward about 12 miles. About 2,000 acres of Pima or long-staple cotton and 5,000 acres of short-staple cotton were grown, and a gin for long-staple and a gin for short-staple cottons were operated. Practically all trash produced was inspected with a gin-trash machine, with negative results. Toward the close of the ginning season field inspections were made of the top crop of bolls, and a light infestation of Thurberia weevil was found about 3 miles north of Tubac, in Santa Cruz County, and another at Sahuarita, 18 miles south of Tucson, in Pima County. A supply of bollies was collected, and at the end of the year examination of this material had not quite been completed. A few specimens have been found in material from three additional fields, all located near Tucson. None of the material from the Rillito-Marana district, where the bulk of the crop is grown, has been infested. Only 30 specimens have been found, which, together with the negative gin-trash inspections, indicates that there is a very light infestation in the top crop of bolls.

The measures used in controlling and preventing the spread of the Thurberia weevil are the same as for the pink bollworm. These consist of disposal of gin trash, sterilization of seed, compression, fumigation, and roller treatment of lint, and the clean-up of gins, oil mills, etc., at the end of the season. The results of each of these activities are included in the figures given for the pink bollworm.

BEE CULTURE

Pollination studies on the Pacific coast show that bees shift their activities to fruit varieties in accordance with the sugar concentration of the nectar. Fruit-tree varieties within the same species were found to show wide variation in nectar concentration, resulting in wide variability in the pollenizing effectiveness of bees.

Cooperative studies with the University of California on the cost of honey production indicate that the average cost is 6.9 cents per pound, while the average price received by producers during the year was 4.5 cents per pound. Of 225 California apiaries studied in 1933, 8 percent made a profit, 8 percent broke even, and 84 percent operated at a loss. Similar conditions prevailed in 1934.

Uncontaminated beeswax is known to be white, but white wax required for the manufacture of candles, cold creams, etc., has been difficult to prepare from the crude brown and yellow western beeswaxes. Studies in cooperation with the University of California have shown that brown stains were caused by iron rendering utensils. Wax rendered in glass, aluminum, and stainless steel was white or yellow. The source of yellow pigment was found to be pollen, although some pollens do not impart color to beeswax.

Loco weed (*Astragalus trichopodus*) was found to cause a wide-spread death of adult bees in southern California. It was likewise found that Matilija poppy (*Romneya coulteri*) also affects adult bees. Four other plants, three of which occur in California, are now definitely known to be poisonous to bees.

The difficulty of combating American foulbrood, a contagious disease of bees is further emphasized by the fact that the disease has recurred in the experimental apiary at Somerset, Md., in combs that had been treated with formaldehyde and in which healthy brood had been reared for a period of 5 years. Studies conducted in cooperation with the University of Wyoming in an apiary of 1,700 colonies indicated that honey produced above queen excluders in diseased colonies in practically all cases contains enough spores of American foulbrood to constitute an infectious dose. This fact is contrary to the general belief. On the other hand, out of 58 samples of honey, representing a crop of 220,000 pounds from a commercial apiary in Wyoming having a more or less constant infection of American foulbrood, all showed a spore content less than the minimum infectious dose.

Work is under way to test the resistance of Caucasian, Carniolan, and common black bees to European foulbrood, another contagious disease of bees, and although it is generally conceded that this disease can be readily controlled, an unusually virulent type of this disease has been found in New England. The indications so far are that this particular strain is not amenable to the usual methods of treatment.

Surveys of pollen reserves in commercial apiaries in the Intermountain States bear out the result of previous experimental work that an abundance

of pollen in the hives in the fall is highly beneficial to successful wintering and to the production of strong colonies for the honey flow. Beekeepers have long supposed that too much pollen in the hives in the fall was detrimental. In connection with this work it has been found that individual colonies vary widely as to the quantities of pollen stored in the fall and that localities also differ widely with respect to the availability of pollen.

In cooperation with the Railway Express Agency, a preliminary study of the loss of package bees and queens in transit has been completed. Recommendations relative to methods of shipping and handling bees in transit have been put into effect, with the result that losses are now almost inconsequential, and beekeepers and express agencies have expressed their appreciation of the work of the Bureau in reducing losses.

INSECTS AFFECTING MAN AND ANIMALS

SCREW WORM

During 1934 the screw worm fly spread rapidly from the relatively small area in southern Georgia and northern Florida infested in 1933, so that by the close of the summer of 1934 a large number of infestations occurred in the States of Georgia, Florida, Alabama, Mississippi, and Louisiana, and a few in South Carolina. In the West the infestation joined with the area of normal infestation in Texas and other Southwestern States. During the late summer and fall of 1934 the pest had increased to such proportions that its ravages resulted in heavy loss to the farmers and stockmen. As a result of urgent requests for assistance, the sum of $5,000 was transferred from another appropriation to aid in the direction of a campaign against this pest. The Emergency Relief Administration in each of the States of Mississippi, Georgia, and Florida also provided $7,500 to carry on educational and control work in these States.

In order to prevent the repetition of the losses suffered in 1934, the act making appropriations for the fiscal year ending June 30, 1936, approved May 17, 1935, provided an immediately available appropriation of $480,000. Of this sum, $425,000 is being used to conduct a wide-spread cooperative educational and control campaign in South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and southeastern Texas; and $55,000 for research work with the hope of developing more effective and cheaper control methods. The primary screw worm fly (*Cochliomyia americana* C. and P.) is probably responsible for 90 percent or more of infestations. It breeds only in living animals and can, so far as known, be controlled by killing the larvae before they reach maturity. The control work aims, therefore, to teach livestock owners methods to prevent exposing their animals to the attack of the fly and how to treat animals that may be infested. To assure that the proper treatment is applied, medicine in sufficient quantities to treat infested animals is furnished free.

On June 30, 1935, 249 men were engaged in this work in 320 counties, and approximately 23,000 gallons of pine-tar oil and 15,000 gallons of benzol had been distributed to these counties.

Studies have been continued on the biologies and habits of both species of screw worm flies and also of related blowflies. Results of investigations of the parasites and predators of the immature stages of the secondary screw worm fly (*Cochliomyia macellaria* Fab.) indicate that artificial propagation of such insects offers a means of reducing screw worm infestations in wildlife.

HORSE BOTS

Investigations on methods for controlling stomach bots of horses have developed an effective treatment for destroying the infective larvae of *Gasterophilus intestinalis* DeGeer which remain in the eggs attached to the hair of the animal for a considerable period after oviposition has ceased. The method, which consists simply in bathing the infested portion of the host with water at a temperature of 118° F., is particularly valuable in supplementing the carbon disulphide treatment in the fall of the year.

STABLE FLY

Certain modifications incorporated in the type of trap which operates by the animals walking through it give promise of greatly reducing the annoyance to livestock caused by the stable fly. Preliminary study of the breeding

habits of this fly along the coast of Florida disclosed that prolific breeding takes place in decomposing piles of *Sargassum* sp., a brown marine alga. Destruction of such breeding places would decrease the abundance of the fly.

AUSTRALIAN CATTLE TICK

Experiments carried out cooperatively with the Bureau of Animal Industry and the Florida Livestock Sanitation Commission on the Australian cattle tick (*Margaropus annulatus australis* Fuller) confirm the field observations that deer serve as an effective host of this tick. Apparently, however, there is greater individual and seasonal variation as to the number of ticks reared than in the case of the more normal bovine host.

BLACK FLIES OR BUFFALO GNATS

An outbreak of black flies (*Simulium* sp.) during the spring of 1935 in Arkansas and Louisiana, especially in the Mississippi Delta area, caused considerable injury and some deaths in livestock. An interesting discovery, and one which may have a definite bearing on finding some method of controlling these injurious insects which have heretofore been more or less immune to control procedure, was made during the winter of 1934. It was found that under laboratory conditions eggs undergo a period of aestivation for as long as 8 months. Under field conditions the eggs are washed into river cut-offs and bayous, where the stagnant water is unfavorable for development. The advent of subsequent floods and the consequent agitation of the water where the eggs have remained dormant produce ideal conditions for the emergence of enormous numbers of the adult gnats.

EYE GNATS

Observations on the biology and abundance of eye gnats in the Winter Garden section of southwestern Texas were carried on throughout the year. In June of the current year a representative of the Bureau was sent to assist in the reorganization of the gnat abatement district of Coachella, Calif., where the residents were anxious to continue the control measures recommended by the Bureau.

MOSQUITOES

Much assistance has been rendered by the Bureau to various local, State, and Federal agencies in making mosquito surveys, and waging control campaigns in the States of South Carolina, Georgia, Florida, Alabama, Oregon, and Washington.

In the Southeast, mosquito surveys, with recommendations as to suitable control methods, were made at Parris Island, S. C., in cooperation with the United States Marine and the Naval Medical Corps; at Savannah, Ga., and Yorktown, Va., in cooperation with the National Park Service; and at Roanoke Island and adjacent territory on the North Carolina banks. Studies of the salt marshes and salt-marsh mosquitoes of Florida have been carried out during the year, and assistance has been given to county organizations, the State board of health, and the Emergency Relief Administration in mosquito-control problems. In the control of *Aedes aegypti* L., considerable help was given to several towns and cities in Florida which suffered an outbreak of dengue fever.

Mosquito-control activities in the Northwest consisted principally in directing projects in Multnomah County, Oreg., under funds allotted by S. E. R. A. and the city of Portland; and in the Columbia National Forest in cooperation with the Forest Service of the North Pacific region.

Experimental work has been carried out to test the effectiveness of mosquito larvicides and methods for controlling *Mansonia perturbans* Walker and other species in Florida, and *Aedes aldrichi* D. and K., *A. vexans* Meig., and the so-called "snow-water" species in the Pacific Northwest.

Investigations have been carried on, in cooperation with the Pathological Division of the Bureau of Animal Industry, on the transmission of the fatal malady of horses known as "equine encephalomyelitis" by mosquitoes. It has been shown in numerous tests that the yellow fever mosquito, *Aedes aegypti*, is an efficient carrier of the western strain of the disease, but a very poor carrier of the eastern strain. The only instance in which the eastern strain was transmitted from an infected to a healthy guinea pig was in the

case of a lot of infected mosquitoes which were fed on the footpads of the healthy guinea pig. The mosquitoes were infected by feeding on diseased guinea pigs at the height of the cerebral period and by feeding on a suspension of the crushed brains of guinea pigs who died of the disease. The disease was transmitted to normal guinea pigs as early as 7 days and as late as 68 days after the infective meal. This indicates that the mosquitoes, after becoming infected, may carry the disease as long as they live.

SAND FLIES

Drainage and diking work in controlling salt-marsh sand flies have been continued and extended in Georgia under the partial direction of the Bureau.

USE OF BLOWFLY MAGGOTS IN THE TREATMENT OF INFECTED WOUNDS

The objects of this investigation have been (1) to devise a satisfactory method of producing sterile maggots and of having them available throughout the year, so that surgeons could depend upon their hospital laboratories to have a continuous supply at all times; (2) to work out, in cooperation with surgeons, successful means of applying the maggot treatment to human wounds; (3) to investigate how maggots produce their remarkable healing effects.

The first two objectives have now been carried out, and surgeons desiring to use maggots should have no difficulty in getting sterile maggots or in knowing how to use them. Work on the third objective shows that, in addition to removing the diseased tissue, maggots excrete certain substances into the wound, and that one of these substances, called "allantoin", stimulates healing. This material can also be purchased, and during the last 4 months considerable quantities of it have been used with gratifying effects by doctors throughout the United States. Excretions of maggots also contain another substance, not yet identified, which in laboratory tests killed certain disease-causing bacteria in 5 to 15 minutes without injuring human tissues.

HOUSEHOLD AND STORED-PRODUCT INSECTS

Considerable assistance has been given to householders, commercial firms, and Federal and local agencies in controlling household and stored-product insect pests. Among other studies conducted during the year, the investigations on insects attacking cottonseed meal in storage, the effect of insect fumigants on paper, and the development of a fumigant for clothes moths are important.

As a result of the purported decrease in the use of cottonseed meal as a fertilizer, larger stocks of this material were kept in storage during the past year. These stocks became heavily infested with the cigarette beetle. The losses caused by this insect were not so much due to damage to the meal itself as to destruction of sacks and the cost of labor involved in resacking. It was found that fumigating with hydrocyanic acid gas at the rate of 1 pound of sodium cyanide to 1,000 cubic feet of storage space, followed by a second treatment 1 month later, using one-half the amount of cyanide, gave satisfactory control.

In cooperation with the Bureau of Standards, tests were made to determine the effect of fumigants on representative samples of documents which were to be placed in the new Federal Archives Building.

Tests conducted during the year suggest that hydrogenated naphthalene (tetrahydronaphthalene) is a promising fumigant against clothes moths. Experiments with this material, conducted under conditions which approached those actually found in the home, indicated that it is more effective as a fumigant against the webbing clothes moth than a mixture containing 75 percent of ethylene dichloride and 25 percent of carbon tetrachloride.

IDENTIFICATION AND CLASSIFICATION OF INSECTS

The number of insects received for identification has increased even over the large number submitted in the previous fiscal year. Specialists have devoted practically their entire time to the identification of this material but have been unable to meet the increasing demands of this service. In the attempt to name the specimens submitted for identification, investigations started on the classification of several groups of insects were further restricted and only a few studies of this nature have been completed and submitted for publication.

FOREIGN PARASITE INTRODUCTION

During the year special effort has been made to eliminate living host material from the shipments of natural enemies forwarded to the United States. This was largely accomplished in dealing with the parasites of the oriental fruit moth, the Japanese and Asiatic beetles, the pink bollworm, and the hessian fly. In these cases the results were highly satisfactory, and it is planned to extend this method to other activities.

The principal hosts of the parasites imported and the countries in which the material was obtained were:

Insect hosts of the parasites:	*Countries in which the material was collected*
Oriental fruit moth	Japan, Chosen.
Japanese and Asiatic beetles	Do.
European corn borer	Italy.
Pink bollworm	Egypt.
Alfalfa weevil	France, Italy.
Hessian fly	France.
Pine shoot moth	Austria.
Larch case bearer	Do.
Birch leaf miner	Do.
Elm leaf beetle	France, Italy.

ORIENTAL FRUIT MOTH PARASITES

A total of approximately 25,000 cocoons and 5,000 adults were forwarded during the year. Twelve species of parasites were secured from this material for liberation; the most abundant of these were *Dioctes molestae* Uch., *Phaeogenes nigridens* Wesm., and *Macrocentrus thoracicus* (Nees). The success attending shipments of adults is illustrated in the case of a consignment of 4,096 *Phaeogenes nigridens* females forwarded in cool storage via Panama. This shipment reached the laboratory at Moorestown, N. J., 5 weeks later with less than 1 percent mortality.

JAPANESE AND ASIATIC BEETLES

The importation of parasites of these beetles from Japan and Chosen has continued on a small scale. Shipments were made of *Tiphia popilliavora* Roh., a larval parasite of the Japanese beetle, *Tiphia* sp. no. 29, parasitic upon the Asiatic garden beetle, and *Tiphia* sp. no. 6–b, parasitic upon the latter host and the imported serica. All of these were shipped in the adult stage.

EUROPEAN CORN BORER PARASITES

What is expected to be the last bulk shipment of corn borer larvae from Europe was collected in northern Italy in November and December 1934 and forwarded to the United States in January 1935. This comprised a total of 1,113,000 field-collected larvae and was estimated to contain 17,000 *Inareolata punctoria* Roman, 167,000 *Lydella grisescens* R. D., and 4,730 *Eulimneria alkae* E. and S. All of these are larval parasites already established in the United States and are to be used in extending the area of colonization.

PINK BOLLWORM PARASITES

Investigations of the parasites of this pest of cotton were started in Egypt in October 1934. Colonies of adult parasites of several species for rearing purposes were secured through the courtesy of the Egyptian Ministry of Agriculture. Shipments were made of *Microbracon kirkpatricki* Walk., a promising parasite originating in east Africa, *Exeristes roborator* (Fab.), and *Elasmus* sp. All of these arrived in excellent condition and are now being reared in quantity at the laboratory of the Division of Cotton Insect Investigations at Presido, Tex.

ALFALFA WEEVIL PARASITES

Small shipments of alfalfa weevil parasites have been forwarded from France and Italy. A total of 1,726 adults of the egg parasite *Peridesmia phytonomi* Gahan were forwarded to the California Agricultural Experiment Station dur-

ing February and March for colonization in that State. Small consignments of *Bathyplectes corvina* Thoms. and *Tetrastichus incertus* Foerst., both of which are larval parasites, have also been made.

HESSIAN FLY PARASITES

Small shipments of *Platygaster pleuron* Walk. and *Trichacis remulus* Walk. were made during the spring of 1935. Both of these are minor parasites of the hessian fly in Europe.

EUROPEAN PINE SHOOT MOTH PARASITES

Bulk collections of shoots infested with the pine shoot moth were made in Austria during May and June, and these were forwarded to the United States for rearing out the parasites. Examination of samples indicates that this material contains sufficient numbers of nine species of parasites for colonization. The most important of these are *Copidosoma geniculatum* Dal., *Lypha dubia* Fall., and *Tetrastichus turionum* Htg.

LARCH CASE BEARER PARASITES

During March a total of 200,000 hibernating cases were collected in Austria and forwarded to the United States. Representative samples revealed a parasitization of 44 percent. The greater portion of these were *Chrysocharis laricinellae* Ratz.

BIRCH LEAF MINER PARASITES

Field collection of leaf mines of the birch leaf miner was conducted in September 1934 in Austria, and a total of 32,000 of these shipped to the United States. The dominant parasites were *Phanomeris phyllotomae* Mues. and several species of Chalcidoidea. Three thousand immature stages of the former and 11,300 of the latter were forwarded, in addition to the quantity of host cells mentioned.

ELM LEAF BEETLE PARASITES

Insectary tests indicate that *Tetrastichus xanthomelaenae* Marchal, the egg parasite of the elm leaf beetle, passes the winter in the adult stage, and this may explain the difficulty of securing establishment in the United States. Several shipments of reared and field-collected material were forwarded during May and June. Field parasitization in southern France attained a maximum of 53 percent in 1935. Eight thousand hibernating elm leaf beetles were forwarded to the United States in March, and dissections of samples indicated a parasitization of 9.5 percent by the tachinid fly *Anachaetopsis nitidula* (Rond.). This parasite attacks both the adult beetle and the larva.

COOPERATION WITH FOREIGN ORGANIZATIONS

Informal cooperative work has been conducted during the year with a number of foreign organizations. The Canadian Department of Agriculture arranged for the collection of 250,000 corn borer larvae in Japan, and assistance was given by this Bureau in assembling the material and in rearing out the parasites at the Moorestown laboratory. A shipment of 48,000 cocoons of the larch sawfly collected in Japan by this division, with funds provided by the Canadian Department, was forwarded to Canada in December 1934. These were heavily parasitized by an undetermined tachinid fly.

In early June 1935 the Canadian Department of Agriculture forwarded two shipments comprising 11,000 adults of *Collyria calcitrator* Grav. for colonization in the sections of Ohio and Pennsylvania infested with the black grainstem sawfly.

Shipments of parasites have been forwarded during the year to the countries listed in table 19.

TABLE 19.—*Shipments of parasites to foreign countries during the fiscal year*

Country	Host	Parasites
Egypt	Mediterranean fruit fly	*Opius humilis* Silv.
Do	do	*Diachasma tryoni* Cam.
Do	do	*Tetrastichus giffardianus* Silv.
Do	Pink bollworm	*Microbracon mellitor* Say.
Italy	Oriental fruit moth	*Glypta rufiscutellaris* Cress.
Do	do	*Macrocentrus delicatus* Cress.
Fiji	Mediterranean fruit fly	*Opius humilis* Silv.
Do	do	*Diachasma tryoni* Cam.
Do	do	*Tetrastichus giffardianus* Silv.
Poland	White grubs	*Elis* spp.
Do	do	*Tiphia* spp.
Mexico	Pink bollworm	*Exeristes roborator* (Fab.)
Do	do	*Microbracon brevicornis* Wesm.

CONTROL INVESTIGATIONS

TESTS OF HOUSEHOLD INSECTICIDES AGAINST HOUSE FLIES

The testing of various household insecticides against house flies by the method of Peet and Grady and by a turntable method, which was devised in the Division of Control Investigations, was carried on in cooperation with various insecticide manufacturers. The object of these studies is to improve the methods of testing so that satisfactory specifications for fly sprays can be written. One of the requirements is the adoption of a standard insecticide with which unknown samples may be compared. Phenothioxin was found to have some promise as a standard.

SURVEY OF THE INSECTICIDAL VALUE OF DOMESTIC SPECIES OF ROTENONE-BEARING PLANTS

In cooperation with the Division of Drug and Related Plants of the Bureau of Plant Industry, the insecticidal action of extracts of some 300 samples of roots of *Cracca*, chiefly *C. virginiana*, collected in 18 different States, was tested against house flies. The most effective roots were found in eastern Texas, southwestern Georgia, and Florida. The plants found north of Georgia possessed very little toxicity. The sample most toxic to house flies was collected in Harrison County, Tex., and contained 1.8 percent of rotenone. The demonstration of correlation between the Durham qualitative color test for rotenone and the effectiveness of the extracts of *Cracca* has facilitated the search for plants of high toxicity and the selection of plants for cultural experiments.

INSECTICIDAL EFFECT OF ALCOHOLIC EXTRACTS OF PYRETHRUM

In cooperation with the Food and Drug Administration, tests of the insecticidal action of samples of extracts of pyrethrum were made to find which of the three methods of chemical analysis for pyrethrins was best correlated with the insecticidal properties. Tests were also made on the insecticidal effect of mixtures of alcoholic solutions of pyrethrins and rotenone.

TESTS OF ORGANIC COMPOUNDS AGAINST MOSQUITO LARVAE

Some 200 synthetic organic compounds, made or obtained by the Division of Insecticide Investigations, were tested during the fiscal year against mosquito larvae. In addition to phenothiazine, which was more toxic than rotenone to culicine mosquito larvae, 14 other compounds were found that compared favorably with rotenone in toxicity. Organic compounds of iodine were found to be more toxic than organic fluorine compounds.

GELATINE-FILM METHOD FOR TESTING INSECTICIDES

A method applicable to testing the effect of light on the toxicity of various types of insecticides by imbedding them in a thin film of gelatine was worked out during the past year. When cabbage worms were fed gelatine film containing derris, in cabbage-leaf sandwiches, they were killed. Pyrethrum powder fed in the same way did not kill them. On the other hand, the cabbage worms

were poisoned by crawling over pyrethrum-impregnated films and were not affected when they crawled over films impregnated with derris. Pyrethrum in this case acted as a contact insecticide while the derris powder did not.

THE EFFECT OF LOW TEMPERATURES ON LARVAE OF THE CIGARETTE BEETLE

As a preliminary step toward investigating the possibility of eliminating infestations of the cigarette beetle in tobacco by holding it in commercial cold storages, experiments were made to determine the temperatures necessary to kill uncovered larvae of the cigarette beetle. The results showed that freezing temperatures were not necessary for the destruction of the larvae if the period of exposure were of sufficient length.

RELATIVE TOXICITY OF ARSENATES OF CALCIUM

Experimental work has shown that there may be a wide variation in the toxicity of calcium arsenates containing the same amounts of calcium oxide and arsenic pentoxide. Tests with silkworm larvae have shown that calcium arsenates containing water of crystallization were much more toxic than analogous anhydrous compounds. Certain anhydrous compounds failed to kill at the highest dosages taken by the larvae, while the analogous hydrated compounds were very toxic.

ATMOSPHERIC FUMIGATION OF BALED COTTON

The experimental work in fumigation of baled cotton at atmospheric pressure was completed within the fiscal year.

STERILIZATION OF GRAPES FROM SPAIN

Grapes imported from Spain were treated in commercial quantities in cold storages in New York and Boston for possible infestation with the Mediterranean fruit fly. The method of applying the treatment and the supervision of its application during the first part of the season were a part of the work of the Division of Control Investigations.

STERILIZING RICE STRAW BY HEAT

A method of sterilizing imported rice straw was worked out which consists in placing the bales of straw in a vacuum chamber, reducing the pressure, and then applying steam at 10 pounds above atmospheric pressure and holding it for 2 hours. This treatment can be applied to bales of rice straw which do not exceed 30 pounds per cubic foot in density.

FUMIGATION OF VETCH SEED

Tests were made to determine (1) the concentration of two fumigants, hydrocyanic acid and carbon disulphide, that could be applied to vetch seed without danger of injury, and (2) the concentration necessary to kill the various stages of the weevil *Bruchus brachialis* Fahr. which might be contained therein.

MISCELLANEOUS CONSTRUCTION AND TESTING

Considerable work was done in testing car-fumigation houses along the Mexican border to determine whether the improvements made within the past year would make it possible to reduce either the dosage of hydrocyanic acid used in fumigation or the period of exposure.

INSECTICIDE INVESTIGATIONS

During the fiscal year chemists working under the direction of the Insecticide Division were assigned to the following field laboratories: Manhattan, Kans., to assist in the fumigation work carried on by the Division of Cereal and Forage Insect Investigations; Vincennes, Ind., to assist in the study of codling moth control conducted there by the Division of Fruit Insect Investigations; and Takoma Park, Md., to assist with closely related work of entomologists of the Division of Control Investigations. The insecticide laboratory at Wenatchee, Wash., was transferred in February 1935 to Yakima, Wash., in

the interest of better cooperation with the Yakima laboratory of the Division of Fruit Insect Investigations.

Search among plant materials for new insecticidal compounds was continued. Perhaps the outstanding result was the finding of anabasine in the leaves and roots of the tree tobacco (*Nicotiana glauca*) of the Southwestern States. Anabasine is an alkaloid, very similar to nicotine in its physical, chemical, and insecticidal properties, which was first prepared synthetically in the Division of Insecticide Investigations several years ago, and which was later found in a Russian weed, namely, *Anabasis aphylla.*

Many plant samples reputed to possess insecticidal properties were received from various tropical countries, and 12 of them, namely, "Casearia timuo", *Cassia chamaecrista*, *Croton capitatus*, *Helenium autumnale*, *H. tenuifolium*, *Ichthyomethia* sp. (bark), *Jacquinia keyensis*, *Lonchocarpus capassa*, *L. monospermus*, *Maclura pomifera*, *Piscidia communis*, and *Pterocarpus angolensis*, were put through an exhaustive chemical examination, without, however, the finding of any particularly promising compounds. Derris and cube continue to hold front rank as organic insecticidal materials, and the study of them was continued. Considerable progress was made in the attempt to correlate the toxicity of particular samples with various chemical determinations, which it is hoped will lead to the possibility of evaluating such materials in the chemical laboratory without recourse to laborious biological testing. A critical study of the methods of determining rotenone was also carried out, which unearthed certain errors in the previously used procedure and led to the development of a more satisfactory method. *Cracca virginiana*, or devil's shoestring, continued to be the only American plant in which rotenone has been found. During the year an exhaustive study was made of several hundred samples. Of these samples, 330 were collected by the Bureau of Plant Industry in its survey of the occurrence of this plant over the United States, and the results show that the best samples come from Georgia, Florida, and Texas. Two samples were found that contained 1.8 percent of rotenone; many contained only traces or none at all.

Considerable attention was devoted to nicotine, including a search for insoluble nicotine compounds. One promising new material of this class was developed. This product, called nicotine-peat, is the result of the combination of nicotine with powdered peat. Some peats when used in their natural state hold as much as 9.9 percent of nicotine in relatively insoluble form, and after simple acid treatment some others can hold as much as 13.7 percent. A second material, a solid soluble by-product of the other, known as nicotine humate, was developed at the same time, and may find a place as a substitute for the more volatile nicotine sulphate. It contains about 33 percent of nicotine.

The study of pyrethrum as an insecticide was renewed, and some important forward steps were made. A method was developed for preparing one of the two active principles, namely, pyrethrin II, in a high state of purity by a method much more simple and much less drastic than any previously used. Considerable progress was also made toward a similar separation of pyrethrin I. As a result of these studies it will be possible to test the toxicity of the two compounds separately and determine their relative insecticidal value. A new and much simpler method of determining pyrethrin II was developed which will facilitate not only research studies on pyrethrum but control work in analytical laboratories as well.

Of the synthetic organic chemicals made in the laboratory, only two compounds, namely, phenothiazine and phenothioxin, seem to merit particular attention. Phenothiazine, an organic sulphur compound, with the formula $C_{12}H_9NS$, was given a field trial against the codling moth in the summer of 1934. The crude material then available commercially was only about 50 percent pure and very dark colored, and the rather poor results obtained are perhaps to be attributed to these facts. A new method of preparing the product was developed by which it is easy to prepare a pure, light-colored product. At the suggestion and under the guidance of the Division of Insecticide Investigations a large commercial concern undertook production of phenothiazine by the new method, and large batches of excellent material became available to the bureau for testing in the spring of 1935. Many substituted derivatives of phenothiazine were prepared, but all proved less toxic and hence of little interest. Effort was also made to develop pyridine derivatives, similar to the phenothiazine derivatives, but nothing promising was obtained. The other compound that in preliminary tests showed marked toxicity to codling moth was phenothioxin. Methods of preparing both a crude, oily material containing

a large proportion of this compound, and the pure substance itself, were worked out, but no large batches were made. The toxicity of this compound apparently disappears rather rapidly after application to foliage, perhaps because of volatility.

Fundamental studies of the characteristics of oil emulsions, to develop specifications for the preparation and mode of application of the best possible insecticidal preparations of this nature, have been continued at the laboratory at Wooster, Ohio. Particular attention was paid to the development of means of estimating oil deposits, as insecticidal efficacy is primarily dependent upon the quantity of oil that adheres to the foliage of a sprayed plant. In previous years it was found possible to recover and measure highly refined mineral-oil deposits, but the method is tedious, and it fails with vegetable oils; so attention was turned to laboratory methods, and in some cases it was found possible to predict the oil deposits on chrysanthemum foliage by means of experiments made with paraffined plates. Studies have also been made to find other insecticidal materials which, when added to oil emulsions, would dissolve in the oil phase and enhance its insecticidal or ovicidal effect, particular attention being directed to oil-soluble combinations of nicotine. Two promising types of materials were found, namely, a combination of nicotine with beta-naphthol and the nicotine salts of the halogenated fatty acids.

At Manhattan, Kans., a study was begun of several problems connected with the fumigation of flour mills and flour products. Determinations of the concentration of hydrocyanic acid gas in typical fumigations were made, and the superiority of fumigating the milling machinery rather than the mill as a whole was demonstrated. The importance of maintaining a high vacuum in connection with vacuum fumigation of flour products was demonstrated. The great effect the load of flour has in absorbing the hydrocyanic acid, hence requiring larger dosages than the size of the chamber would seem to indicate, was shown.

In connection with experiments conducted in cooperation with the Bureau of Plant Industry to determine the effect of washing on the removal of spray residues on apples, numerous analyses were required, many being made in replicate to furnish data for statistical study of variations. Two special studies of the variation to be expected among the apples in a sample were made, 100 individual apples from an unwashed lot being run at Washington, D. C., and 100 groups of 2 apples from a washed lot being run at Wenatchee, Wash. The former lot showed an extreme variation from 0.073 to 0.214 around a mean of 0.140 grain per pound, and the latter lot a range from 0.006 to 0.050 around a mean of 0.028.

Considerable work was done on the determination of spray residues of rotenone and nicotine deposited by sprays containing derris, cube, and various nicotine mixtures. The red colorimetric test for rotenone previously developed proved fairly suitable for following the loss of derris deposit after spraying, and the nicotine could also be determined satisfactorily.

A study was made of the lead and arsenic content of 11 chewing tobaccos and 7 snuffs, requiring the development of satisfactory methods of analysis. In the samples analyzed, the lead content of the chewing tobaccos ranged from 0.025 to 0.610 grain per pound, and of the snuffs from 0.088 to 0.935 grain per pound. The arsenic content proved in some cases to be higher than was expected on the basis that lead arsenate had been used, but this may have been due to the additional use of other arsenicals.

A new line of work was undertaken in the form of an investigation of accessory materials used to improve the stability or ease of application of insecticides. Stress was laid upon the study of wetting and spreading agents. At the College Park, Md., station a study of the sulphated higher alcohols, which have recently come into prominence as suggested aids in the removal of spray residue from fruit, was undertaken, and it was found that, whereas they do not break down immediately in acid solutions as the soaps do, they do undergo hydrolysis and hence should be freshly prepared. At Washington, D. C., a physicochemical study of wetting and spreading power was begun, making use of measurements of surface tension and interfacial tension against a standard petroleum oil. Detailed studies were made of some soap solutions, from which the great dependence of wetting power on concentration and on the ratio of alkali to fatty acid is easily seen. Numerous commercial wetting agents have been studied, and the claims for some of them shown to be extravagant. In the course of this work two qualitative methods of visually demonstrating moderate differences in wetting and spreading power were de-

veloped, depending on the displacement, by the solution being studied, of a film of oil spread on a glass plate or a celluloid surface, respectively.

The study of the relative toxicity of insecticidal materials to goldfish, which has as its object the discovery of possible relationships between toxicity and chemical constitution upon which future synthetic work can be based, was continued throughout the year. The principal experimental study involved the determination of the relationship between the optically active and optically inactive isomers of dihydrodeguelin. It was found that the optically active compound is approximately twice as toxic as the inactive compound. This fact has an important bearing on the question of the toxicity of derris, cube, and other rotenone-bearing roots, for it is now believed that the deguelin they contain is optically active, and hence it may be appreciably more toxic than the inactive variety on which all toxicological results have been based so far.

A rather extensive investigation of calcium arsenate was undertaken. The dependence of the insecticidal and phytocidal properties of calcium arsenate on its mode of preparation and finished chemical constitution is not well understood. The work during the year confirmed the existence of a previously suggested definite basic arsenate which can be called tetracalcium arsenate. A phase-rule study of the whole system (lime, arsenic acid, and water) was also started in the hope that the higher temperature adopted, 62° C. (143.5° F.), will result in attainment of equilibrium, a goal that was not reached in a similar study conducted several years ago at 35° C. (95° F.).

A few examples of the miscellaneous analytical and investigational work done to aid in various activities of the Bureau indicate the scope or volume of these activities. One hundred and ten samples of miscellaneous insecticidal materials, such as calcium arsenate, spray oils, and fluorine compounds, were analyzed to check on their suitability for experimental use; 70 samples of derris, cube, and other rotenone-containing powders were examined; numerous chemical reagents were tested for arsenic for the Bureau of Chemistry and Soils, etc. Analyses were made of 380 samples of pine wood to which insecticidal materials had been applied. Of these samples, 199 were from trees injected with sodium arsenite, 36 from trees receiving copper sulphate, 96 from trees to which mercuric chloride had been applied, and 49 from trees that received sodium fluoride. These determinations required the development of special methods of analysis, since the resins in the wood interfered with the application of the methods ordinarily used for insecticidal elements in organic materials.

A search was made through the 737,560 United States patents issued during the 17-year period from 1917 to 1933, inclusive, and 47 mimeographed lists containing the numbers and brief abstracts of those relating to insect-destroying devices, insecticide sprayers and dusters, fruit washers, and washing procedures, etc., were issued.

TRANSIT INSPECTION

Transit inspection was inaugurated at a few strategic railway terminals in 1920 for the specific purpose of enforcing the white pine blister rust quarantine in effect at that time. The value of checking mail, express, and freight shipments of restricted plants in interstate movement, and turning back those moving to uninfected regions, was immediately recognized, and the work has been expanded from year to year to cover other railway centers and to include enforcement of all Federal domestic plant quarantines. The effectiveness of such inspection is shown by the gradual reduction in the percentage of violations found. There were 11.9 violations per 1,000 shipments inspected in 1920 in the enforcement of 1 quarantine, and only 0.6 violation per 1,000 shipments inspected in 1934 in the enforcement of 11 quarantines.

Of special interest in the work of the fiscal year 1935 was the finding of 56 live Japanese beetles at Chicago on July 11 and 12 in a refrigerator car of beans arriving from New Jersey. The car had been partially unloaded, and careful inspection was immediately made of all hampers available at commission-merchant houses. Intensive inspection of produce arriving from the infested areas was continued throughout the summer by inspectors of the Japanese beetle and transit inspection projects, and 88 live beetles and 157 dead ones were taken from 97 of the 314 cars inspected during the season. Bean cars contained the largest number of beetles. Railway agencies were required to fumigate or thoroughly clean such infested cars under the supervision of an inspector.

White pine blister rust infection was found on a white pine being shipped to an uninfected State. It is altogether probable that other shipments intercepted in transit inspection carried injurious plant pests under quarantine. A thorough examination of plants and soil in such shipments would doubtless furnish interesting and valuable information as to the presence of pests, but the time of transit inspectors can be employed more profitably in determining whether the numerous shipments passing through the terminals during the day had been inspected and certified at origin in compliance with quarantine regulations.

Many of the important stations where transit inspection is carried on are inadequately manned, and a few strategic points through which freight, express, and parcel-post shipments are consigned to extensive and important agricultural areas are totally without inspection because of the small amount of funds appropriated for this project.

Active cooperation is rendered by several of the States in which transit inspection is conducted. The State inspectors engaged in the work are appointed collaborators of the Department. The adequate enforcement of Federal plant quarantine regulations is vital to State protection and such cooperation should be extended to other points now worked only by Federal inspectors. In such cooperative work, the transit inspectors report to the State authorities shipments of nursery stock moving without State nursery inspection certificates or with invalid or expired certificates, although such shipments are not intercepted and returned because of the absence of statutory authority. As the direct result of several years of this work, a continued decrease is noted in the number of noncertified shipments moving through transit-inspection points.

In tables 20 and 21 it will be noted that during the fiscal year 1935, 894,395 shipments were inspected for quarantine compliance at 25 points and that 1,749 were found moving in apparent violation of Federal quarantine regulations. The tables include not only stations where Federal inspection is maintained, but also stations worked cooperatively with the States, and with other projects of the Bureau. Year-round inspection with a full-time force was carried on only at Boston, Chicago, Jacksonville, New York, Philadelphia, and Washington, D. C. Inspection during nursery-stock shipping seasons was maintained at Kansas City, Omaha, St. Paul, Portland, Oreg., Seattle, and Spokane. The Pittsburgh work did not begin until May 1. Other points in the table represent either part-time cooperative inspection or places where only a few days' work was done to determine the status of a city as a transit-inspection point.

TABLE 20.—*Summary of shipments of nursery stock and other plants and plant products inspected in transit during the fiscal year 1935*

Station	Shipments	Carloads	Station	Shipments	Carloads
	Number	*Number*		*Number*	*Number*
Atlanta	4,228	----------	New York	137,054	224
Boston	42,185	----------	Omaha and Council Bluffs	33,424	12
Chicago	102,480	208	Philadelphia	282,869	373
Cincinnati	57	----------	Pittsburgh	78,289	1
Cleveland	10,253	47	Portland, Oreg	22,724	27
Dallas	494	----------	St. Louis	334	----------
Detroit	10,542	83	St. Paul and Minneapolis	37,175	----------
Fort Worth	104	----------	Seattle	16,324	----------
Indianapolis	14,592	----------	Spokane	12,923	----------
Jacksonville	37,487	[1] 267,085	Washington	10,046	6
Kansas City	39,354	----------			
Memphis	652	----------			
Milwaukee	805	----------	Total	[2] 894,395	268,066

[1] Waybill information.

[2] Of the above shipments, 597,340 were consigned by parcel post; 256,230 by express; and 40,825 by freight.

TABLE 21.—*Shipments of nursery stock and other articles intercepted in violation of Federal plant quarantines*[1] *at transit-inspection points, fiscal year 1935*

Station	Shipments intercepted in apparent violation of quarantine—									
	No. 38	No. 45	No. 48	No. 52	No. 53	No. 62	No. 63	No. 64	No. 71	Total
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
Atlanta			5					2		7
Boston		154	102		3	1	2			262
Chicago	14	41	200	2	6	40	14	1		318
Cincinnati			2							2
Cleveland		2	3							5
Detroit		11	10							21
Indianapolis		1								1
Jacksonville		1	68		1	3				73
Kansas City		1	22		1	27	2	11		64
New York		161	349		20	17	9		1	557
Omaha and Council Bluffs		2	22			18	11			53
Philadelphia		31	253			34	7			325
Pittsburgh	1		83				1			85
Portland, Oreg						2	4			6
St. Louis								3		3
St. Paul and Minneapolis	2		4			6	9	1		22
Seattle	12		1		5	3	9			30
Spokane	1						4			5
Washington			2			3	1			6
Total	30	405	1,126	2	36	154	73	18	1	[2] 1,845

[1] Quarantine No. 38 relates to black stem rust; No. 45, to the gypsy moth and brown-tail moth; No. 48, to the Japanese beetle; No. 52, to the pink bollworm; No. 53, to the satin moth; No. 62, to narcissus pests; No. 63, to the white pine blister rust; No. 64, to the Mexican fruit worm; and No. 71, to the Dutch elm disease.

[2] The total number of violations represents 1,749 shipments, of which 82 were in violation of 2 quarantines, and 7 were in violation of 3 quarantines.

In addition to the figures shown in the table of violations, transit inspectors intercepted 100 shipments moving intrastate in apparent violation of State quarantines relating to pests covered also by Federal quarantine. Of these interceptions 4 were made at Boston, 1 at Detroit, 53 at New York, 13 at Philadelphia, 28 at Pittsburgh, and 1 at Washington.

TERMINAL INSPECTION OF MAIL SHIPMENTS

Terminal inspection is now maintained in the District of Columbia, in the States of Arizona, California, Florida, Louisiana, Mississippi, Montana, Oklahoma, Oregon, Utah, and Washington, and in the Territories of Hawaii and Puerto Rico. No change has been reported during the year in the inspection points or in the list of plants and plant products subject to terminal inspection.

CONVICTIONS AND PENALTIES IMPOSED FOR VIOLATIONS OF THE PLANT QUARANTINE ACT

The following convictions and penalties imposed for violations of the Plant Quarantine Act were reported to the Bureau during the year:

European corn borer quarantine (domestic): One conviction, with fine of $100.

Gypsy moth and brown-tail moth quarantine: Two convictions, with fines aggregating $50.

Japanese beetle quarantine: Six convictions, with fines aggregating $310.

Quarantines affecting Mexican plant products: Fines aggregating $452 were imposed by customs officials on the Mexican border against 298 persons caught attempting to smuggle in from Mexico prohibited plants and plant products.

Quarantines affecting Canadian plant products: Fines aggregating $10 were imposed by customs officials on the Canadian border against two persons caught attempting to smuggle in from Canada prohibited plants.

FOREIGN PLANT QUARANTINES

Twenty-four foreign plant quarantines and regulatory orders of the Department prohibiting or restricting the entry of various plants and plant products into the United States, 8 domestic quarantines affecting the movement of such material between the Territories of Hawaii and Puerto Rico and continental United States, and 4 miscellaneous regulatory measures are enforced through the Division of Foreign Plant Quarantines by inspectors and collaborators stationed at the more important ports of entry and at points distributing foreign mail, and working in close cooperation with employees of other Federal departments. Detailed information on these quarantines and orders is available in other publications. Enforcement activities in connection with these quarantines and orders are more fully explained in succeeding sections and are accompanied by tables presenting in condensed form records indicating the scope of the work or summarizing its results.

RECORDS OF IMPORTS OF RESTRICTED PLANTS AND PLANT PRODUCTS

Under the various foreign quarantines and orders certain plants and plant products are restricted as to entry and are subject to inspection and, if necessary, disinfection, for the purpose of excluding plant diseases and insect pests. Among such restricted plants and plant products are nursery stock, plants, bulbs, and seeds; fruits and vegetables; grains from certain countries; cotton, cotton waste, cotton wrappings (bagging), and cottonseed products; cottonseed, seed cotton, and cottonseed hulls from the Imperial Valley, Baja California, Mexico; bagasse; elm logs from European countries (prohibited entry after Jan. 1, 1935); and certain packing materials. A record is given of the importation of the products inspected by inspectors of the Bureau and, if necessary, treated under their supervision.

IMPORTATIONS OF NURSERY STOCK, PLANTS, BULBS, AND SEEDS

The importations recorded in tables 22 to 24 were entered under permit, subject to inspection and treatment, when necessary, under regulation 3 of Quarantine No. 37.

TABLE 22.—*Importation of fruit and nut cuttings and scions and of rose stocks under regulation 3, Quarantine No. 37, by country of origin, fiscal year 1935*

[Figures indicate actual number of propagating units]

Kind of material	Azores	Belgium	Bulgaria	Canada	Cuba	England	France	Germany	Greece
Cuttings and scions:									
Apple			51	1,198					
Apricot			42						
Avocado									
Cherry			42	54					
Fig									9
Grape	30	20	245	18			163		12
Nut				164					
Peach									
Pear			56	27					
Pineapple					22,006				
Plum			23	680					
Prune									
Spondias									
Rose stocks						622,000		2,000	
Total	30	20	459	2,141	22,006	622,000	163	2,000	21

TABLE 22.—*Importation of fruit and nut cuttings and scions, etc.*—Continued

Kind of material	Honduras	Hungary	Italy	Netherlands	Poland	Scotland	Union of Soviet Socialist Republics	Total 1935	Total 1934
Cuttings and scions:									
Apple					1,400			2,649	565
Apricot							64	106	63
Avocado	41							41	141
Cherry					875			971	109
Fig			6					15	234
Grape		206	52				75	821	88,051
Nut								164	1,003
Peach									5
Pear					550			633	254
Pineapple								22,006	30
Plum			6		450			1,159	160
Prune			5					5	6
Spondias									16
Rose stocks				5,952,825		23,500		6,600,325	6,536,150
Total	41	206	69	5,952,825	3,275	23,500	139	6,628,895	6,626,787

TABLE 23.—*Importation of bulbs under regulation 3, quarantine no. 37, by country of origin, fiscal year 1935*

Kind of bulbs	Bermuda	Canada	China	Czechoslovakia	England	France	Germany	Greece	India	Ireland
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
Chionodoxa		24			6					
Convallaria		62					12,194,980			
Crocus		162			3,940					
Eranthis					200					
Fritillaria		1			200					
Galanthus					7,567		12			150
Hyacinth	4,500	915			12	346,350				
Ixia		6								
Lily	235,975	1,447	3,070	72	3,482	436,086	6	99	6,294	36
Muscari					512		27			
Narcissus [1]			17,880							
Scilla					1,960					
Tulip		959			421	138,950				
Total	240,475	3,576	20,950	72	18,300	921,386	12,195,025	99	6,294	186

Kind of bulbs	Italy	Japan	Manchuria	Mexico	Netherlands	Scotland	Switzerland	Union of South Africa	Union of Soviet Socialist Republics	Total
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
Chionodoxa					482,429					482,459
Convallaria					34,985					12,230,027
Crocus					9,057,353		500			9,061,955
Eranthis					301,774					301,974
Fritillaria					364,209					364,410
Galanthus					682,594	9				690,332
Hyacinth	25,000				12,990,104					13,366,881
Ixia					330,775			52		330,833
Lily	2,046	17,514,523	363	2	487,329				90	18,690,920
Muscari					1,147,126					1,147,665
Narcissus [1]										17,880
Scilla					1,482,476	12			1,000	1,485,448
Tulip		41,849			71,050,564				16,719	71,249,462
Total	27,046	17,556,372	363	2	98,411,718	21	500	52	17,809	129,420,246

[1] Narcissus importations under regulation 3 of quarantine no. 37 are limited to importations of the Chinese sacred lily (*Narcissus tazetta* var. *orientalis*), the entry of which is permitted into the Hawaiian Islands for local use and distribution in those islands only.

TABLE 24.—*Importation of seeds under regulation 3, Quarantine No. 37, by country of origin, fiscal year 1935* [1]

Country	Apple	Apricot	Banana	Cherry	Elm	Nut and palm	Ornamental and tree
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Argentina							4
Australia						14,761	17
Austria	1,067			833			43,599
Bahama Islands							4
Belgian Congo							2
Bolivia						15	
Borneo						2	
Brazil						181	3
British Guiana						8	
British Honduras						6	
Canada				11		82	7,888
Canal Zone						9	3
Ceylon							2
China					440	1,175	1,114
Colombia						64	
Cuba						15	7
Czechoslovakia	51						25,598
Denmark				2			918
Dominica							1
Dutch Guiana						3	
Ecuador						90	
England							5
France	10,847			1,100		10	17,278
Germany				310			1,382
Greece							1
Guam						3	
Guatemala						3	
Honduras						11	1
India						8	9
Italy	200						54,276
Jamaica							4
Japan		5		1	1,389	1,548	3,005
Java							20
Madagascar							1
Malay States						1	
Manchuria					6		410
Mexico			11			1	8
Netherlands							52
New Zealand							3
Norway							1
Philippine Islands						10	4
Scotland							50
Seychelles Islands						75	
Spain							4
Straits Settlements						14	
Tahiti						4	
Trinidad						208	13
Uganda							1
Union of South Africa						2	5
Uruguay							1
Venezuela							9
Total	12,165	5	11	2,257	1,835	18,309	155,703

[1] In addition to the importations indicated in this table, the following seeds were imported: Into continental United States, 466 small mail packages of miscellaneous seeds, from 57 foreign countries; into Puerto Rico, 2,188 pounds of ornamental and tree seeds from Canal Zone, Haiti, and India; and into Hawaii, 30 pounds and 4 packages of nut and palm seeds, 270 pounds and 23 packages of ornamental and tree seeds, and 6 pounds and 8 packages of miscellaneous seeds, from Australia, Brazil, Canal Zone, Ecuador, Fiji Islands, France, Germany, Guatemala, India, Japan, Java, New Zealand, Samoa, Society Islands, and the Union of South Africa.

TABLE 24.—*Importation of seeds under regulation 3, Quarantine No. 37, by country of origin, fiscal year 1935*—Continued

Country	Peach	Pear	Persimmon	Plum	Quince	Rose	Miscellaneous	Total
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Argentina								4
Australia								14,778
Austria	6	213		104	11	5		45,838
Bahama Islands								4
Barbados							2	2
Belgian Congo								2
Bolivia								15
Borneo								2
Brazil								184
British Guiana								8
British Honduras							100	106
Canada						8		7,989
Canal Zone							1	13
Ceylon								2
China								2,729
Colombia								64
Cuba							1	23
Czechoslovakia		94				2		25,745
Denmark						1		921
Dominica								1
Dutch Guiana								3
Ecuador							3	93
England						1		6
France		140		16				29,391
Germany				100				1,792
Greece								1
Guam								3
Guatemala								3
Honduras								12
India	2						2	21
Italy								54,476
Jamaica								4
Japan	60	955	37			506		7,506
Java								20
Madagascar								1
Malay States								1
Manchuria	20	1				2		439
Mexico							10	30
Netherlands								52
New Zealand								3
Norway								1
Philippine Islands								14
Scotland								50
Seychelles Islands								75
Spain								4
Straits Settlements								14
Tahiti								4
Trinidad								221
Uganda								1
Union of South Africa	1							8
Uruguay								1
Venezuela								9
Total	89	1,403	37	220	11	525	119	192,689

In addition to the bulbs recorded in table 23, there were imported for propagation under item 6 of this regulation, under permit subject to inspection, 2,312,387 pounds of onion and garlic sets, of which 1,832,291 pounds were imported from Greece and 479,881 pounds from Canada. The remainder was imported in small lots from Denmark, France, Germany, Hungary, and Japan.

In addition to the foregoing, there were imported during the fiscal year 1935 from the Dominion of Canada under regulation 15 of Quarantine No. 37 into continental United States, 875,492 bulbs, plants, trees, and cuttings, and into Hawaii, 421 bulbs, plants, and other materials.

To authorize the importation of this material 859 permits were issued, as compared with 746 permits issued during the fiscal year 1934.

The record of entry under special permits issued under the provisions of regulation 14 of Quarantine No. 37 for the purpose of keeping the country supplied with new varieties and necessary propagating stock and for experimental, educational, or scientific purposes, is furnished in table 25.

TABLE 25.—*Special-permit importations, fiscal year 1935, with combined total for fiscal years 1920–35*

Class of plants	Fiscal year 1935				Total for fiscal years, 1920–35			
	Permits issued		Importations under permits		Permits issued		Importations under permits	
	Number	Quantity [1] authorized	Number	Quantity [1] imported	Number	Quantity [1] authorized	Number	Quantity [1] imported
Dahlia	204	7,090	175	4,749	1,163	69,837	998	49,611
Gladiolus	156	276,187	145	192,175	2,247	51,184,936	1,913	29,005,153
Iris, bulbous	64	1,861,410	41	1,168,543	1,691	56,113,789	1,430	40,522,030
Iris, rhizomatous	53	2,870	52	2,371	1,682	300,780	1,481	162,363
Narcissus	79	[2] 637,632	82	[2] 900,037	1,553	164,858,074	1,311	80,386,040
Orchid	280	21,907	228	13,435	2,620	281,184	2,301	212,218
Peony	43	2,653	34	1,697	1,340	1,402,586	1,100	686,850
Rose	108	40,533	95	30,014	1,628	314,770	1,447	225,563
Fruit (trees and small fruits)	42	7,083	33	1,999	301	30,193	211	6,546
Herbaceous	211	34,065	167	24,724	2,090	4,921,438	1,674	203,330
Miscellaneous bulbs, roots, etc	253	133,335	222	88,007	2,341	13,239,489	2,010	875,273
Ornamental	437	270,031	476	196,943	3,322	4,401,992	3,077	11,550,628
Total	[3] 1,767	3,294,796	[3] 1,519	[3] 2,624,694	[3] 19,242	297,119,068	[3] 16,251	163,885,605

[1] Quantity refers to number of propagating units, such as plants, bulbs, corms, tubers, cuttings, and other materials.

[2] The difference between the number of narcissus bulbs imported and those authorized may be explained by the fact that some of the permits under which these bulbs were imported were issued during the previous fiscal year.

[3] The disparity between this figure and the actual total of the column above is explained by the fact that a single permit may authorize the entry of more than 1 class of plants and in such instances is listed separately under each class.

During the year 1,767 special permits were issued authorizing the entry of 3,294,796 plants, bulbs, and other materials. A total of 2,624,694 plants, bulbs, etc., were imported, as compared with 668,246 in 1934. Increased importations, as compared with those in 1934, are noted in all classes. The largest increase is in importations of bulbous iris; there were 1,008,520 more iris bulbs imported in 1935 than in 1934. In 1935 more special permits were issued and the number of permits under which importations were made was greater than during any previous year since Quarantine No. 37 was promulgated. Sixty-three percent of the importations were authorized entry by mail under the special arrangement with the Treasury and Post Office Departments whereby plant importations may be made by mail. The distribution of importations of special-permit material by States is shown in table 26.

TABLE 26.—*Distribution, by States, showing plants, bulbs, and other materials, of special-permit material imported during the fiscal year 1935*

State or Territory	Dahlia	Gladiolus	Iris, bulbous	Iris, rhizomatous	Narcissus	Orchid	Peony
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
California	119	391	100,024	414	509	3,836	1,151
Colorado		10,931					
Connecticut	33					400	38
Delaware						108	
District of Columbia		300			27	10	
Florida	10	3	50,013	2	14	2,199	
Hawaii	9	64			48	1,088	
Idaho		59					
Illinois	510	31,908		38			16
Indiana	169	12,807		7			
Iowa		1,003					
Kentucky		655				2	
Louisiana						28	
Maryland	50	682	50,000		74,518	39	
Massachusetts	424	14,091		19		634	12
Michigan	34	15,784	2,535		612		34
Minnesota	151	8,117		519			
Missouri		36				27	
New Hampshire		6,000		7		39	
New Jersey	1,098	5,220		145		2,204	9
New York	951	9,422	256,865	1,009	521,489	429	81
North Carolina		5,000	106,000	12	66,447		
North Dakota		29,513		70			
Ohio	361	2,226	4,000	12	3,998	133	19
Oregon	330	27,422	25	96	46,682	23	
Pennsylvania	146				101	1,641	19
Puerto Rico						432	
Rhode Island	80	912			54,525		14
South Dakota							131
Tennessee			600	8	260		
Texas			50,000			19	
Utah		604					
Vermont		5,957				47	
Virginia	65				68,457	2	10
Washington	156	84	548,481	13	62,296	5	159
West Virginia					54		
Wisconsin	53	2,984				90	4
Total	4,749	192,175	1,168,543	2,371	900,037	13,435	1,697

State or Territory	Rose	Fruit	Herbaceous	Miscellaneous bulbs, roots, etc.	Ornamental	Total
	Number	*Number*	*Number*	*Number*	*Number*	*Number*
Alabama					100	100
Arizona			4	62	532	598
Arkansas				8		8
California	185		307	19,417	12,421	138,774
Colorado			153		213	11,297
Connecticut	12		260	1,016	142	1,901
Delaware			4	54	6	172
District of Columbia			3	140	41	521
Florida			189	2,270	20,658	75,358
Georgia	52	100			27	179
Hawaii		154		395	431	2,189
Idaho						59
Illinois	4	107	588	140	172	33,483
Indiana	52	3	377	242	27	13,684
Iowa						1,003
Kansas			4		12	16
Kentucky				55	85	797
Louisiana	12		5,950		3,105	9,095
Maryland			1	2	19	125,311
Massachusetts	3	14	338	159	2,843	18,537
Michigan	10	18	794	293	184	20,298
Minnesota			48	76	42	8,953
Mississippi				300		300
Missouri	12	6			20	101
Nevada				30	6	36
New Hampshire		1	49	22	45	6,163
New Jersey	3,123	524	3,191	966	42,162	58,642
New Mexico				5		5
New York	25,468	93	7,562	38,143	99,614	961,124
North Carolina				7,965		185,426

TABLE 26.—*Distribution, by States, showing plants, bulbs, and other materials, of special-permit material imported during the fiscal year 1935*—Continued

State or Territory	Rose	Fruit	Herbaceous	Miscellaneous bulbs, roots, etc.	Ornamental	Total
	Number	*Number*	*Number*	*Number*	*Number*	*Number*
North Dakota						29,583
Ohio	27	294	3,913	13,998	10,850	39,831
Oregon	59		102	384	37	75,160
Pennsylvania	890	299	11	1,181	519	4,807
Puerto Rico	40		28	2	17	519
Rhode Island			10		500	56,041
South Carolina				204		204
South Dakota		385	105		122	743
Tennessee					61	929
Texas	46			188	477	50,730
Utah				90		694
Vermont				45	4	6,053
Virginia					1	68,535
Washington	1	1	629	143	1,363	613,331
West Virginia	18			12		84
Wisconsin			104		85	3,320
Total	30,014	1,999	24,724	88,007	196,943	2,624,694

IMPORTATION OF ELM LOGS UNDER QUARANTINE NO. 70

Under the provisions of Quarantine No. 70, on account of the Dutch elm disease, 50 elm logs from Europe were imported subject to hot-water treatment as follows: Through the port of Baltimore, 20 logs; through New York, 8 logs; and through Norfolk, 22 logs. Hot-water treatment was applied at the following places: Baltimore, 20 logs; Indianapolis, 8 logs; New Albany, Ind., 14 logs; and New York, 8 logs.

Quarantine No. 70, effective October 21, 1933, providing for the entry of elm logs from Europe if free from bark, subject to hot-water treatment as a condition of entry, was amended, effective January 1, 1935, to prohibit the importation of elm logs from Europe. This action was taken for the reason that logs were arriving with the bark incompletely removed. In some cases the adhering remnants of bark were found infested with living adults and larvae of scolytid beetles, which are known to have a part in the spreading of the fungus causing the Dutch elm disease.

IMPORTATIONS OF COTTON, COTTON WRAPPINGS (BAGGING), COTTONSEED HULLS, AND COTTONSEED PRODUCTS

Tables 27 to 30, inclusive, indicate, respectively, the importations during the fiscal year of cotton, cotton waste, cotton wrappings (bagging), cottonseed hulls, and cottonseed products, which were inspected and, when necessary, fumigated or otherwise treated under supervision. The actual number of bales of cotton, cotton waste, and bagging is indicated and, inasmuch as bales vary in size, they are referred to as running bales.

TABLE 27.—*Importation of running bales of ginned cotton, by country of growth and port of entry, fiscal year 1935*

Country	Boston	Calexico	Detroit	El Paso	Fabens	Galveston	Houston	Island Pond	Mobile	New Orleans	Newport
Anglo-Egyptian Sudan	5,671										
Argentina	2										
Brazil	303										
British West Indies	10										
China	900										
Egypt	37,545										
India	5,176										
Mexico		9,500		225	300						
Peru	98										
United States (returned)	1,429		421			833	15,215	1	9	2	571
Unknown	25										
Total	51,159	9,500	421	225	300	833	15,215	1	9	2	571

TABLE 27.—*Importation of running bales of ginned cotton, by country of growth and port of entry, fiscal year 1935*—Continued

Country	New York	Niagara Falls	Norfolk	Portland	Saint Albans	San Francisco	San Pedro	Seattle	Vanceboro	Total
Anglo-Egyptian Sudan										5,671
Argentina										2
Brazil	919						220			1,442
British West Indies	2									12
China	1,867			315		471	424	731		4,708
Ecuador	7									7
Egypt	6,680									44,225
Hawaii						3				3
India	21,997					969	1,864	50		30,056
Japan							150	80		230
Mexico	5,023					3,184	1,907			20,139
Netherland India	1,142					700				1,842
Peru	1,398									1,496
Puerto Rico	19									19
United States (returned)		14			208		3,591		10	22,304
Unknown	24,650		53							24,728
Total	63,704	14	53	315	208	5,327	8,156	861	10	[1] 156,884

[1] Includes 40,755 bales linters.

TABLE 28.—*Importation of running bales of cotton waste, by country of origin and port of entry, fiscal year 1935*

Country	Baltimore	Boston	Buffalo	Charleston	Detroit	Houston	New Orleans	Newport	New York	Niagara Falls
Argentina									3	
Belgium		1,808							6,065	
Canada		536	178		314			116		190
China	500	960					50		21,412	
Colombia									165	
Czechoslovakia									109	
England		6,804		6		97			6,080	
France		181							3,010	
Germany									1,048	
India		1,121							25,447	
Italy									178	
Japan	454	1,075		300					15,913	
Netherlands	111	422							1,980	
Scotland		19								
Spain									1,816	
United States (returned)	70									
Total	1,135	12,926	178	306	314	97	50	116	83,217	190

Country	Norfolk	Philadelphia	Portland	Richford	Rouses Point	St. Albans	San Francisco	San Pedro	Savannah	Seattle	Total
Argentina											3
Belgium											7,873
Canada				25	476	1,703					3,538
China		11,984					3,104	803		60	38,873
Colombia											165
Czechoslovakia											100
England	10	159							73		13,229
France							80				3,271
Germany		15									1,063
India		133					50				26,751
Italy											178
Japan		3,435	50				2,927	1,306	200	2,522	28,182
Netherlands											2,513
Scotland											19
Spain											1,816
United States (returned)		5				3					78
Total	10	15,731	50	25	476	1,706	6,161	2,109	273	2,582	127,652

TABLE 29.—*Importation of running bales of bagging, by country of origin and port of entry, fiscal year 1935*

Country	Baltimore	Boston	Buffalo	Charleston	Detroit	Galveston	Houston	Mobile	New Orleans	Newport	New York	Niagara Falls
Algeria											54	
Argentina			36			31	1				142	
Australia											9	
Austria				132								
Belgium		449		225		236	1,032		99		3,977	
Canada		772	102		5,757					90	93	996
China	412			412			207					
Cuba	40								287			
Czechoslovakia				138								
Egypt		216									1,512	
England	54	837		138		6,712	4,456	167	5,183		801	
France		1,539				540	4,604		1,169		1,918	
Germany		134				740	1,566				15	
India	200					159	416				60	
Ireland	69	52									194	
Italy							5,446		297		845	
Japan	1,100	800		9,740		1,241	6,633		8			
Kenya						16						
Netherlands		73		176		43	909		368		1,703	
New Zealand											10	
Norway								560	792			
Portugal							188				219	
Puerto Rico											991	
Rhodesia, Southern						19						
Scotland						10,086					2,081	
Spain						56	916				5,087	
Total	1,875	4,872	138	10,961	5,757	19,879	26,374	727	8,203	90	19,711	996

Country	Norfolk	Philadelphia	Port Huron	Ranier	Rochester	Rouses Point	Saint Albans	San Francisco	San Pedro	Savannah	Seattle	Total
Algeria												54
Argentina												210
Australia												9
Austria												132
Belgium	571	44								409		7,042
Canada	360		1,258	12	278	59	50					9,827
China									620			1,651
Cuba												327
Czechoslovakia												138
Egypt												1,728
England	6,020	2,182								1,404		27,954
France	460	62								390		10,682
Germany	149									562		3,166
India												835
Ireland												315
Italy												6,588
Japan	3,000							521	563	2,100	100	25,806
Kenya												16
Latvia	20											20
Netherlands										378		3,650
New Zealand												10
Norway												1,352
Poland	654											654
Portugal												407
Puerto Rico	40											1,031
Rhodesia, Southern												19
Scotland	107											12,274
Spain	564											6,623
Total	11,945	2,288	1,258	12	278	59	50	521	1,183	5,243	100	122,520

TABLE 30.—*Importation of cottonseed hulls and cottonseed products, fiscal year 1935*

Port	Cottonseed hulls [1]	Cottonseed cake	Cottonseed meal	Cottonseed oil
	Pounds	*Pounds*	*Pounds*	*Gallons*
Baltimore			3,722,000	
Boston			8,566,000	
Brownsville		8,641,193	7,000	102,488
Calexico	5,827,970			
Eagle Pass		8,931,033	972,195	89,907
El Paso		514,137	2,370,696	267,672
Hidalgo		26,222		
Laredo		35,240,323	508,751	511,021
Naco				13,336
New York		226	21,443,101	
Nogales		1	110,205	
Philadelphia			4,768,000	
Portland		1,117,180	400,000	
Presidio			54,167	
San Francisco		32	1,000,923	
San Pedro			640,000	
Seattle		222,000	750,000	
Total	5,827,970	54,692,347	[2] 45,313,038	984,424

[1] Cottonseed hulls are permitted entry only from the Imperial Valley, Baja California, Mexico.
[2] Includes 7,400,000 pounds of fertilizer composed principally of cottonseed meal.

In addition, the Bureau supervised the entry of 18,883 samples of cotton, cotton linters, cotton waste, and bagging imported by freight, express, and parcel post, and as passenger baggage.

This year's importations of cotton waste are the largest since 1923. Of outstanding interest, however, are the importations of cottonseed cake, meal, and oil, which represent for each commodity the largest yearly importations since cottonseed products were placed under restriction in July 1917. A comparison of the importations of these several commodities with the average yearly importations thereof for the preceding 10-year period, July 1, 1924, to June 30, 1934, is as follows, with figures for this year's importations given first: Cotton waste, 127,652 bales—52,843.4 bales; cottonseed cake, 54,692,347 pounds—2,448,677.5 pounds; cottonseed meal, 45,313,038 pounds—1,128,339.2 pounds; cottonseed oil, 984,424 gallons—2.55 gallons.

During the 10 preceding years a total of only 63 permits were issued for the entry of cottonseed cake, meal, and oil. This year 265 permits were issued.

IMPORTATIONS OF GRAIN, BROOMS, AND BROOMCORN

Table 31 shows the importations of shelled corn and seeds of related plants inspected under the provisions of Quarantine No. 41.

TABLE 31.—*Importation of clean shelled corn and clean seed of other plants covered by Quarantine No. 41, by country of growth, fiscal year 1935*

Country	Corn	Sorghum	Sudan grass	Country	Corn	Sorghum	Sudan grass
	Pounds	*Pounds*	*Pounds*		*Pounds*	*Pounds*	*Pounds*
Argentina	829,909,611	269,581	7,133,382	Manchuria		1,500,000	
Australia			2,778,630	Mexico	321,758,863		
Bahamas	75			Netherlands	336		
Brazil	132		35,801	Rhodesia, Southern	17,244,584		
Bulgaria	11			Rumania	30,604,610		
Canada	198,159			Union of South Africa	50,728,765		59,065
Chile	8			United States (returned)	149,771,247		
Cuba	824,926			Venezuela	42		
Dominican Republic	11,314,222			Yugoslavia	10,109,803		
England	28,332						
Haiti	87,500						
Hungary			561,048				
Italy	50			Total	1,436,113,396	1,769,581	10,567,926
Kenya	13,532,120						

TABLE 32.—*Importation of brooms and broomcorn under Quarantine No. 41, by country of origin, fiscal year 1935*

Country	Brooms	Broomcorn	Country	Brooms	Broomcorn
	Number	*Bales*		*Number*	*Bales*
Argentina		11,391	Mexico	49,664	1,123
Hungary		32,950			
Italy	14,892	2,877	Total	64,556	48,341

In addition, inspection was made under Quarantine No. 41 of the following: Corn on the cob, green, 20,165 pounds; and corn on the cob, mature, 4,070 pounds.

The Bureau also supervised the entry under Quarantine No. 24 of 5,000,105 pounds of shelled corn and under Quarantine No. 55 of the following: Seed or paddy rice, 2,488,671 pounds; rice straw, 5,400 bales; and articles made of rice straw, 914.

The entry of shelled corn has been restricted from all foreign countries and localities by quarantines since January 1, 1927. This year's importations of shelled corn under existing corn Quarantines Nos. 24 and 41 represent the largest yearly importations since that date. They total 1,441,113,501 pounds. The average yearly importations under these two quarantines during the 7½-year preceding period were 58,675,188 pounds. The importations under Quarantine No. 41 of sorghum seed, Sudan grass seed, and broomcorn are also without precedent in point of size. Importations of sorghum seed amounted to 1,769,581 pounds and of Sudan grass seed to 10,567,926 pounds. The respective average yearly importations of these two commodities for the 7½ preceding years were 56,023.6 pounds and 70,703.6 pounds. Broomcorn importations (table 32) totaled 48,341 bales this year. The average yearly importations of this commodity for the 10-year preceding period, July 1, 1924, to June 30, 1934, were 589.2 bales. Under Quarantines Nos. 24 and 41, the number of permits issued this year was 644. Last year 172 permits were issued.

This year's importations of seed or paddy rice from Mexico under Quarantine No. 55 are the largest since 1930. (The entry of seed or paddy rice is prohibited from all other foreign countries and localities.)

IMPORTATION OF BAGASSE UNDER QUARANTINE NOS. 15 AND 16

Effective October 1, 1934, Foreign Sugarcane Quarantine No. 15 was amended to authorize the entry of specific materials on condition that they have been or are to be so treated, processed, or manufactured that, in the judgment of the Department, their entry will involve no pest risk.

Effective January 1, 1935, Domestic Sugarcane Quarantine No. 16 was similarly amended to allow entry from Puerto Rico and Hawaii.

Under these quarantines as amended importations have been made under permit as follows: Under Quarantine No. 15, from foreign countries—bagasse, 3,729,136 pounds, and bagasse dust, 765 pounds; under Quarantine No. 16, from Puerto Rico and Hawaii—bagasse, 56,136 pounds, and bagasse flour, 70 pounds.

IMPORTATIONS OF FRUITS AND VEGETABLES

Tables 33 and 34 show by countries of origin and ports of entry, respectively, the kinds and quantities of fruits and vegetables imported into the continental United States and into Hawaii and Puerto Rico during the fiscal year under permit and subject to inspection at the port of first arrival under the provisions of Quarantine No. 56, as well as importations of mandarin oranges under Quarantine No. 28, and potatoes under the regulations governing the importation of potatoes into the United States. The total of these importations is 52,226,825 bunches of bananas, 743,425 crates of pineapples, and 246,763,579 pounds of all other commodities listed. On the basis of weight it is estimated that the total importations are approximately 25 percent in excess of those made during the preceding year. In addition, 746 emergency permits were issued for the entry of small lots of fruits and vegetables found in passengers' baggage, involving kinds previously approved for entry at the ports in question.

TABLE 33.—*Fruits and vegetables imported, by countries of origin, fiscal year 1935*

[Imported under Quarantine No. 56 unless otherwise designated]

Kind	Country and quantity	Total
Apple—pounds	Denmark, 163; England, 100; Netherlands, 550; Newfoundland, 96; New Zealand, 916,650; Sweden, 50.	917,609
Apricot—do	Chile, 22,130	22,130
Aralia cordata—do	Japan, 2,120	2,120
Arrowhead—do	China, 170,574; Japan, 250	170,824
Artichoke:		
Globe—do	Argentina, 60	60
Jerusalem—do	Mexico, 70	70
Asparagus—do	Argentina, 106,822; Chile, 3,416; Mexico, 35	110,273
Asperula odorata—do	Germany, 5½	5½
Avocado—do	Cuba, 6,296,401; Mexico (seeds removed), 39,112	6,335,513
Balsamapple—do	Cuba, 2,166; Mexico, 3,500	5,666
Banana—bunches	British Honduras, 341,234; Cayman Islands, 89; Colombia, 3,627,126; Costa Rica, 2,898,535; Cuba, 6,207,932; Dominica, 2; Dominican Republic, 3,350; Ecuador, 1,061,074; Guadeloupe, 187; Guatemala, 4,580,748; Haiti, 577,902; Honduras, 13,978,090; Jamaica, 1,470,582; Martinique, 13; Mexico, 8,852,160; Nicaragua, 3,110,454; Panama (including Canal Zone), 5,517,299; Trinidad, 48.	52,226,825
Bean (green):		
Faba—pounds	Mexico, 107	107
Lima—do	Cuba, 3,582,922; Mexico, 65,628	3,648,550
String—do	Cuba, 29,927; Mexico, 996,609	1,026,536
Beet—do	Cuba, 250; Mexico, 230,821	231,071
Berry (*Rubus*):		
Frozen—do	Scotland, 171,000	171,000
Natural—do	Norway, 1,547; Scotland, 150,000	151,547
Broccoli—do	Cuba, 25	25
Cabbage—do	Cuba, 22,080; Mexico, 29,824; Netherlands, 391,000	442,904
Cacao bean pod—do	Costa Rica, 216; Trinidad, 763	979
Cactus—do	Mexico, 6,535	6,535
Carrot—do	Bermuda, 500; Cuba, 2,135; Mexico, 484,994	487,629
Cassava—do	Cayman Islands, 175; China, 300; Cuba, 171,593; Guatemala, 20; Panama (including Canal Zone), 750.	172,838
Cauliflower—do	Mexico, 1,474	1,474
Celery—do	Cuba, 221; Mexico, 32	253
Chayote—do	Cuba, 15,414; Jamaica, 30; Mexico, 1,938	17,382
Cherry:		
Dried, sour—do	Yugoslavia, 689,953	689,953
Fresh—do	Argentina, 1,763; Chile, 11,023	12,786
Chinese watermelon—do	Cuba, 100	100
Cipollino—do	Greece, 1,698; Morocco, 2,580,904	2,582,602
Citrus medica—do	Albania, 3,240; Algeria, 100; Italy, 397; Palestine, 14,207.	17,944
Clover top—do	Mexico, 571	571
Coriander—do	Mexico, 369	369
Cowpea—do	Mexico, 150	150
Crescentia alata—do	Mexico, 2	2
Crosnes—do	Belgium, 498	498
Cucumber—do	Cuba, 2,139,631; Dominican Republic, 130; Mexico, 29,650.	2,169,411
Dasheen (includes colocasia, inhame, malanga, taro, and yautia), pounds.	Azores, 261,950; China, 309,001; Cuba, 175,203; Dominican Republic, 1,256,641; Haiti, 2,100; Honduras, 25; Jamaica, 30; Japan, 146,350; Mexico, 983; Nicaragua, 500.	2,152,783
Eggplant—pounds	Cuba, 4,857,581; Dominican Republic, 624; Mexico, 381,917.	5,240,122
Endive—do	Belgium, 1,047,935	1,047,935
Garbanzo—do	Mexico, 32	32
Garlic—do	British Guiana, 6; Chile, 2,699,310; China, 4,806; Cuba, 15,000; Egypt, 7,100; Greece, 75; Italy, 686; Japan, 532; Mexico, 2,201,397; New Zealand, 2,100; Spain, 1,166,654; Uruguay, 1,540.	6,099,206
Ginger (crude)—do	China, 352,404; Cuba, 18,604; Ecuador, 1,500; Japan, 469; Mexico, 32.	373,009
Gourd—do	Mexico, 7	7
Grape—do	Argentina, 9,021,796; Chile, 266,112; Mexico, 652; Spain, 7,568,541.[1]	16,857,101
Grape (hothouse)—do	Belgium, 81,832; Netherlands, 470	82,302
Grapefruit—do	Cuba, 7,528,511; Haiti, 1,200	7,529,711
Horseradish—do	Germany, 1,590; Sweden, 2,262	3,852
Husk tomato—do	Mexico, 8,003	8,003
Japanese horseradish—do	Japan, 555	555
Kale—do	Bermuda, 190,610	190,610
Kohlrabi—do	Mexico, 218	218
Kudzu—do	China, 66,113; Cuba, 180	66,293

Footnotes at end of table.

TABLE 33.—*Fruits and vegetables imported, by countries of origin, fiscal year 1935*—Continued

[Imported under Quarantine No. 56 unless otherwise designated]

Kind	Country and quantity	Total
Leek ---- pounds	Cuba, 585	585
Lemon ---- do	Cuba, 480; Italy, 781,843; Mexico, 53; Uruguay, 800	783,176
Lettuce ---- do	Mexico, 39,260	39,260
Lily bulb (edible) ---- do	China, 25,850; Japan, 165	26,015
Lime (sour) ---- do	Antigua, 3,450; Argentina, 700; Cuba, 51,001; Dominica, 677,386; Dominican Republic, 16,024; Grenada, 31,407; Haiti, 14,867; Honduras, 17,475; Jamaica, 174,630; Mexico, 7,232,708; Montserrat, 338,934; Panama (including Canal Zone), 2,440; Peru, 8; St. Lucia, 800,238; St. Vincent, 3,000; Trinidad, 120,975; Virgin Islands, 14,817.	9,500,060
Mango (seeds removed, frozen) ---- do	Philippine Islands, 408	408
Melon ---- do	Argentina, 177,130; Chile, 4,378,836; Mexico, 1,638,102; Peru, 3,954; Spain, 1,264,299.	7,462,321
Mint ---- do	Cuba, 4,520; Mexico, 28	4,548
Mustard ---- do	Cuba, 8,624; Mexico, 95,053	103,677
Nectarine ---- do	Chile, 298,480	298,480
Nectarine (hothouse) ---- do	Belgium, 7½	7½
Nopale ---- do	Mexico, 515	515
Nuts:		
Acorn ---- do	Turkey, 23,889,770	23,889,770
Chestnut ---- do	China, 16,280; Italy, 13,024,479; Japan, 609,038; Portugal, 844,696; Spain, 8,816.	14,503,309
Okra ---- do	Cuba, 1,338,324; Mexico, 66,040	1,404,364
Onion ---- do	Argentina, 837,752; Australia, 249,097; Bermuda, 91; Chile, 4,232,170; Cuba, 12,651; Egypt, 2,722,430; Hungary, 14; Italy, 1,803,224; Japan, 100,000; Mexico, 392,385; Netherlands, 49,280; Philippine Islands, 35; Portugal, 500; Spain, 253,173.	10,652,802
Orange:		
Under quarantine no. 56:		
Fresh ---- do	Cuba, 51,753; St. Lucia, 120	51,873
Frozen ---- do	Spain, 1,473	1,473
Mandarin (quarantine no. 28) ---- do	Japan, 1,610,264	1,610,264
Papaya ---- do	Cuba, 73,581	73,581
Parsley ---- do	Bermuda, 1,400; Cuba, 50; Mexico, 15,914	17,364
Pea ---- do	Cuba, 3,405; Mexico, 4,214,474	4,217,879
Peach ---- do	Argentina, 9,970; Chile, 66,376	76,346
Peach (hothouse) ---- do	Belgium, 47	47
Pear ---- do	Argentina, 92,328; Chile, 72,571	164,899
Pepper ---- do	Bahamas, 90; Cuba, 4,330,210; Mexico, 3,763,778	8,094,078
Pigweed ---- do	Mexico, 1,015	1,015
Pineapple ---- crates	Azores, 25; Costa Rica, 5; Cuba, 672,389; Dominican Republic, 3,493; Ecuador, 6; Guatemala, 3; Haiti, 183; Honduras, 149; Jamaica, 1; Mexico, 67,169; Panama (including Canal Zone), 2.	743,425
Plantain ---- pounds	Argentina, 2,186; British Honduras, 458,740; Cayman Islands, 3,575; Colombia, 3,242; Cuba, 6,133,550; Dominican Republic, 7,044,950; Haiti, 249,448; Honduras, 462,325; Jamaica, 100; Mexico, 59,820; Nicaragua, 2,700; Panama (including Canal Zone), 486,598; Virgin Islands, 220.	14,907,454
Plum ---- do	Argentina, 51,370; Chile, 40,295	91,665
Potato:		
Under quarantine no. 56 ---- do	Bermuda, 999,794	999,794
Under potato regulations (order of Dec. 22, 1913). pounds	Canary Islands, 40,000; Cuba, 2,165,789; Mexico, 57,623; Spain, 49,068.	2,312,480
Pumpkin ---- do	Cuba, 101,165; Dominican Republic, 24,033; Mexico, 10,876.	136,074
Purslane ---- do	Mexico, 1,938	1,938
Radish ---- do	Cuba, 677; Mexico, 123,128	123,805
Roselle ---- do	Mexico, 30	30
St. Johns bread ---- do	Cyprus, 785,462; Greece, 22,400; Italy, 290,470	1,098,332
Salsify ---- do	Mexico, 1,527	1,527
Shallot ---- do	Belgium, 616	616
Spinach ---- do	Mexico, 67,734	67,734
Squash ---- do	Bermuda, 30; Cuba, 16,853; Mexico, 76,236	93,119
Strawberry ---- do	Cuba, 15; Mexico, 7,326	7,341
Sweetpotato [2] ---- do	China, 4,200	4,200
Swiss chard ---- do	Mexico, 11,451	11,451
Tamarind bean pod ---- do	Antigua, 108,506; Barbados, 2,000; Cuba, 1,000; India, 58,629; Mexico, 1,079; Montserrat, 13,100; St. Lucia, 15,991.	200,305
Tomato ---- do	Argentina, 9,018; Bahamas, 143,643; Canary Islands, 42,792; Cuba, 41,870,159 Mexico, 35,479,651; Virgin Islands, 56,580.	77,601,843
Turnip ---- do	Cuba, 2,778; Mexico, 259,182	261,960

Footnotes at end of table.

TABLE 33.—*Fruits and vegetables imported, by countries of origin, fiscal year 1935*—Continued

[Imported under Quarantine No. 56 unless otherwise designated]

Kind	Country and quantity	Total
Vaccinium (cranberry, etc.):		
Frozen ---- pounds	Newfoundland, 3,498,349	3,498,349
Natural ---- do	Finland, 13,211; Newfoundland, 657,051; Norway, 9,346; Sweden, 2,868.	682,476
Water caltrop ---- do	China, 11,480; Japan, 20	11,500
Waterchestnut ---- do	China, 2,061,188	2,061,188
Watercress ---- do	Mexico, 3,647	3,647
Waterlily root ---- do	China, 16,602; Cuba, 55,378	71,980
Watermelon ---- do	Cuba, 108,090; Mexico, 312,819	420,909
Yam [2] ---- do	China, 23,400; Japan, 12,011	35,411
Yam bean root ---- do	China, 27,100; Mexico, 2,009	29,109

[1] Sterilized by refrigeration.

[2] These sweetpotatoes and yams were imported into Hawaii. Although the importation of sweetpotatoes and yams into continental United States is prohibited by Quarantines 29 and 30, that prohibition does not apply to Hawaii or Puerto Rico.

TABLE 34.—*Fruits and vegetables imported by ports of entry, fiscal year 1935*

[Imported under Quarantine No. 56 unless otherwise designated]

Kind	Port and quantity	Total
Apple ---- pounds	Los Angeles, 550; New York, 917,059	917,609
Apricot ---- do	New York, 22,130	22,130
Aralia cordata ---- do	Hawaii (all ports), 2,120	2,120
Arrowhead ---- do	Boston, 6,000; Buffalo, 13,400; Detroit, 200; Hawaii (all ports), 25,450; Los Angeles, 1,000; New York, 42,800; Niagara Falls, 2,200; Portland, 1,700; San Francisco, 72,110; Seattle, 5,964.	170,824
Artichoke:		
Globe ---- do	New York, 60	60
Jerusalem ---- do	Laredo, 20; San Ysidro, 50	70
Asparagus ---- do	Calexico, 13; New York, 110,238; San Ysidro, 22	110,273
Asperula odorata ---- do	New York, 5½	5½
Avocado ---- do	Baltimore, 414; Boston, 80; Brownsville (seeds removed), 24,057; Douglas (seeds removed), 15; Eagle Pass (seeds removed), 5,551; El Paso (seeds removed), 3,323; Hidalgo (seeds removed), 888; Jacksonville, 420; Key West, 710,689; Laredo (seeds removed), 4,133; Mercedes (seeds removed), 307; Miami, 56,848; New Orleans, 2,484,579; New York, 1,599,478; Nogales (seeds removed), 118; Philadelphia, 1,080; Rio Grande City (seeds removed), 146; Roma (seeds removed), 574; Tampa, 1,442,813.	6,335,513
Balsamapple ---- do	Calexico, 3,500; New York, 2,166	5,666
Banana ---- bunches	Aberdeen, 1,270; Baltimore, 3,498,969; Blaine, 3,559; Boston, 3,082,748; Brownsville, 68,536; Buffalo, 1,050; Calexico, 1; Charleston, 1,214,970; Corpus Christi, 13,893; Detroit, 12,955; Eagle Pass, 12,511; Eastport, 3; El Paso, 337,901; Galveston, 2,547,493; Hidalgo, 1,405; Houston, 47,887; Jacksonville, 976,921; Key West, 1,020; Laredo, 560,582; Los Angeles, 1,931,816; Miami, 250,176; Mobile, 2,123,498; New Orleans, 13,525,289; New York, 14,315,282; Nogales, 6,048; Norfolk, 632,728; Philadelphia, 4,620,688; Portland, 2,850; Puerto Rico (all ports), 464; San Francisco, 1,424,971; San Ysidro, 1; Sault Ste. Marie, 3,530; Seattle, 289,417; Sumas, 40,574; Tacoma, 1,757; Tampa, 674,060; Ysleta, 2.	52,226,825
Bean (green):		
Faba ---- pounds	Calexico, 5; Nogales, 99; San Ysidro, 3	107
Lima ---- do	Laredo, 17,677; New York, 3,582,922; Nogales, 46,870; San Ysidro, 1,081.	3,648,550
String ---- do	Brownsville, 1,339; Calexico, 2,403; Douglas, 2,831; Eagle Pass, 941; El Paso, 38,464; Laredo, 292,741; Mercedes, 2; Naco, 803; New York, 29,927; Nogales, 632,044; San Ysidro, 25,031; Ysleta, 10.	1,026,536
Beet ---- do	Calexico, 2,402; Douglas, 440; Eagle Pass, 235; El Paso, 219,126; Naco, 40; New Orleans, 270; New York, 250; Nogales, 8,042; San Ysidro, 158; Ysleta, 108.	231,071

TABLE 34.—*Fruits and vegetables imported by ports of entry, fiscal year 1935*—Continued

[Imported under Quarantine No. 56, unless otherwise designated]

Kind	Port and quantity	Total
Berry (*Rubus*):		
Frozen ..... pounds..	New York, 171,000	171,000
Natural ..... do....	New York, 151,547	151,547
Broccoli ..... do....	New York, 25	25
Cabbage ..... do....	Calexico, 1,525; Douglas, 5,211; Eagle Pass, 546; El Paso, 797; Laredo, 685; Naco, 1,145; New York, 413,080, Nogales, 19,703; San Ysidro, 212.	442,904
Cacao bean pod ..... do....	New York, 979	979
Cactus ..... do....	Brownsville, 40; Calexico, 4; El Paso, 1,959; Laredo, 4,511; Mercedes, 3; Nogales, 10; San Ysidro, 8.	6,535
Carrot ..... do....	Brownsville, 5; Calexico, 3,935; Douglas, 434; Eagle Pass, 355; El Paso, 452,741; Miami, 110; Naco, 170; New Orleans, 900; New York, 1,625; Nogales, 25,803; San Ysidro, 340; Ysleta, 1,211.	487,629
Cassava ..... do....	Key West, 4,353; New Orleans, 20; New York, 167,330; Seattle, 300; Tampa, 835.	172,838
Cauliflower ..... do....	Calexico, 67; Douglas, 48; Eagle Pass, 30; Nogales, 1,315; San Ysidro, 14.	1,474
Celery ..... do....	Calexico, 18; New York, 221; San Ysidro, 14	253
Chayote ..... do....	El Paso, 140; Key West, 825; Laredo, 1,798; Miami, 3,796; New Orleans, 4,309; New York, 6,514.	17,382
Cherry:		
Dried, sour ..... do....	Boston, 56,490; New York, 567,324; Philadelphia, 66,139.	689,953
Fresh ..... do....	New York, 12,786	12,786
Chinese watermelon ..... do....	New York, 100	100
Cipollino ..... do....	New York, 2,582,602	2,582,602
Citrus medica ..... do....	Detroit, 140; El Paso, 1; New York, 17,803	17,944
Clover top ..... do....	Douglas, 571	571
Coriander ..... do....	Calexico, 369	369
Cowpea ..... do....	Laredo, 150	150
Crescentia alata ..... do....	Nogales, 2	2
Crosnes ..... do....	New York, 498	498
Cucumber ..... do....	Calexico, 318; Douglas, 1,071; Eagle Pass, 102; Key West, 128,691; Laredo, 500; Mercedes, 2; Miami, 93,800; Naco, 283; New Orleans, 83,200; New York, 1,773,216; Nogales, 27,348; Tampa, 61,454; San Ysidro, 26.	2,169,411
Dasheen (includes colocasia, inhame, malanga, taro, and yautia), pounds.	Boston, 132,698; Buffalo, 7,480; Calexico, 983; Detroit, 1,800; Key West, 6,855; Los Angeles, 9,000; Miami, 100; New York, 1,130,507; Niagara Falls, 13,555; Portland, 9,428; Puerto Rico (all ports), 419,222; San Francisco, 282,100; Seattle, 113,888; Tampa, 25,167.	2,152,783
Eggplant ..... pounds..	Brownsville, 330; Calexico, 10; El Paso, 707; Key West, 23,620; Laredo, 1,297; Miami, 3,015; New Orleans, 334,122; New York, 4,437,545; Nogales, 379,553; San Ysidro, 20; Tampa, 59,903.	5,240,122
Endive ..... do....	New York, 1,047,935	1,047,935
Garbanzo ..... do....	Nogales, 32	32
Garlic ..... do....	Boston, 84,400; Brownsville, 10,550; Calexico, 131,921; Douglas, 1,633; Eagle Pass, 12,015; El Paso, 38,943; Hawaii (all ports), 7,132; Hidalgo, 3,998; Laredo, 1,242,078; Mercedes, 24; Naco, 1,100; New Orleans, 155,613; New York, 2,769,827; Nogales, 23,423; Puerto Rico (all ports), 1,614,086; San Francisco, 306; San Ysidro, 2,157.	6,099,206
Ginger (crude) ..... do....	Boston, 8,245; Buffalo, 11,376; Calexico, 32; Chicago, 800; Detroit, 600; Hawaii (all ports), 1,300; Los Angeles, 15,200; New York, 83,208; Niagara Falls, 14,700; Portland, 1,445; San Francisco, 209,401; Seattle, 26,708.	373,009
Gourd ..... do....	Mercedes, 7	7
Grape ..... do....	Boston, 870,044; Brownsville, 150; Calexico, 219; Eagle Pass, 205; Laredo, 56; New York, 15,986,405; Nogales, 22.	16,857,101
Grape (hothouse) ..... do....	New York 82,302	82,302
Grapefruit ..... do....	Boston, 860; Key West, 1,342,810; New Orleans, 1,058,349; New York, 5,127,692.	7,529,711
Horseradish ..... do....	New York, 3,852	3,852
Husk tomato ..... do....	Brownsville, 60; Calexico, 15; Eagle Pass, 3,346; El Paso, 4,540; Nogales, 2; San Ysidro, 40.	8,003
Japanese horseradish ..... do....	Hawaii (all ports), 555	555
Kale ..... do....	New York, 190,610	190,610
Kohlrabi ..... do....	Calexico, 53; El Paso, 165	218
Kudzu ..... do....	Boston, 1,300; Buffalo, 4,516; Detroit, 300; Los Angeles, 700; New York, 11,680; Niagara Falls, 5,100; Portland, 1,000; San Francisco, 38,797; Seattle, 2,900.	66,293
Leek ..... do....	Miami, 135; New York, 450	585

TABLE 34.—*Fruits and vegetables imported by ports of entry, fiscal year 1935*—Continued

[Imported under Quarantine No. 56, unless otherwise designated]

Kind	Port and quantity	Total
Lemon---pounds	Calexico, 1; Mercedes, 2; New York, 783,123; San Ysidro, 50.	783,176
Lettuce---do	Calexico, 1,327; Douglas, 3,482; Eagle Pass, 1,894; El Paso, 280; Naco, 565; Nogales, 31,552; San Ysidro, 160.	39,260
Lily bulb (edible)---do	Boston, 1,500; Buffalo, 1,440; Detroit, 360; Hawaii (all ports), 2,015; New York, 5,300; Niagara Falls, 1,700; Portland, 300; San Francisco, 12,100; Seattle, 1,300.	26,015
Lime (sour)---do	Baltimore, 13,258; Boston, 79,305; Brownsville, 234,801; Eagle Pass, 1,011,485; El Paso, 300,996; Hidalgo, 2,538; Key West, 1,980; Laredo, 4,822,488; Los Angeles, 736,075; Mercedes, 8; Miami, 3,691; New Orleans, 7,057; New York, 2,247,334; Nogales, 23,128; Philadelphia, 2,421; Presidio, 28; Puerto Rico (all ports), 1,562; San Francisco, 10,317; Tampa, 1,588.	9,500,060
Mango (seeds removed) (frozen)---do	Portland, 408	408
Melon---do	Calexico, 1,102; Douglas, 561; Hidalgo, 370; Laredo, 1,590,759; Mercedes, 109; Naco, 10; New York, 5,824,219; Nogales, 44,976; Rio Grande City, 4; San Ysidro, 211.	7,462,321
Mint---do	Calexico, 1; El Paso, 15; New York, 4,520; Nogales, 12	4,548
Mustard---do	Calexico, 12,641; Douglas, 137; El Paso, 79,016; Naco, 60; New York, 8,624; Nogales, 3,189; San Ysidro, 10.	103,677
Nectarine---do	New York, 298,480	298,480
Nectarine (hothouse)---do	New York, 7½	7½
Nopale---do	Douglas, 222; Nogales, 293	515
Nuts:		
Acorn---do	New York, 21,000,859; Norfolk, 1,786,740; Philadelphia, 1,102,171.	23,889,770
Chestnut---do	Boston, 136,028; Hawaii (all ports), 122,561; Los Angeles, 331,763; New York, 13,664,513; San Francisco, 218,714; Seattle, 29,280; Tampa, 450.	14,503,309
Okra---do	Brownsville,[1] 80; Calexico, 42; El Paso, 140; Key West, 25,975; Laredo,[1] 65,778; Miami, 11,127; New Orleans, 436,172; New York, 509,199; Tampa, 355,851.	1,404,364
Onion---do	Boston, 1,471,160; Brownsville, 940; Calexico, 17,771; Douglas, 10,984; Eagle Pass, 14,260; El Paso, 166,906; Hawaii (all ports), 79,401; Key West, 6; Laredo, 142,004; Mercedes, 34; Miami, 2,550; Naco, 3,725; New York, 8,429,974; Nogales, 35,254; Portland, 35; San Francisco, 20,096; San Ysidro, 97; Seattle, 249,600; Tampa, 7,595; Ysleta, 410.	10,652,802
Orange:		
Under Quarantine No. 56:		
Fresh---do	Boston, 2,800; Key West, 42,688; New York, 6,385	51,873
Frozen---do	Baltimore, 1,473	1,473
Mandarin (Quarantine No. 28)---do	Portland, 200,635; Seattle, 1,409,629	1,610,264
Papaya---do	Key West, 13,559; Miami, 24,819; New York, 32,233; Tampa, 2,970.	73,581
Parsley---do	Calexico, 20; Douglas, 61; El Paso, 15,724; Naco, 65; New York, 1,450; Nogales, 2; Ysleta, 42.	17,364
Pea---do	Calexico, 215; Douglas, 1,432; Eagle Pass, 5; Laredo, 1,480; Naco, 295; New York, 3,405; Nogales, 4,101,173; San Ysidro, 109,874.	4,217,879
Peach---do	New York, 76,346	76,346
Peach (hothouse)---do	New York, 47	47
Pear---do	New York, 164,899	164,899
Pepper---do	Brownsville, 1,926; Calexico, 3,259; Del Rio, 451; Douglas, 11,379; Eagle Pass, 52,711; El Paso, 267,650; Hidalgo, 1,142; Key West, 46,050; Laredo, 113,353; Mercedes, 61; Miami, 3,512; Naco, 2,410; New Orleans, 215,918; New York, 4,038,751; Nogales, 3,275,656; Presidio, 142; Rio Grande City, 12; San Ysidro, 32,613; Sasabe, 50; Tampa, 26,069; Ysleta, 963.	8,094,078
Pigweed---do	Douglas, 536; Nogales, 479	1,015
Pineapple---crates	Baltimore, 17; Boston, 11; Brownsville, 1,160; Douglas, 9; Eagle Pass, 2,192; El Paso, 14,108; Jacksonville, 39; Key West, 366,156; Laredo, 47,528; Los Angeles, 30; Miami, 12,005; Naco, 4; New Orleans, 59,260; New York, 227,420; Nogales, 48; Puerto Rico (all ports), 41; San Francisco, 2; Tampa, 13,395.	743,425

[1] Okra was admitted from Tamaulipas, Mexico, through the ports of Brownsville and Laredo under special conditions.

TABLE 34.—*Fruits and vegetables imported by ports of entry, fiscal year 1935*—Continued

[Imported under Quarantine No. 56, unless otherwise designated]

Kind	Port and quantity	Total
Plantain.....pounds..	Baltimore, 55,500; Key West, 426,962; Los Angeles, 3,120; Miami, 207,915; New Orleans, 589,005; New York, 5,454,953; Philadelphia, 82,310; Puerto Rico (all ports), 6,951,229; San Francisco, 40,386; Tampa, 1,096,074.	14,907,454
Plum.....do....	New York, 91,665	91,665
Potato:		
Under Quarantine No. 56.....do....	New York, 999,794	999,794
Under potato regulations (order of Dec. 22, 1913.).....pounds..	Douglas, 25,040; Naco, 5,900; New Orleans, 9,494; New York, 2,156,295; Nogales, 26,683; Puerto Rico (all ports), 89,068.	2,312,480
Pumpkin.....do....	Calexico, 985; Douglas, 2,100; Key West, 2,926; Laredo, 3,354; Mercedes, 1,901; Miami, 300; Naco, 1,420; New York, 121,272; Nogales, 1,061; Rio Grande City, 12; San Ysidro, 43; Tampa, 700.	136,074
Purslane.....do....	Calexico, 768; Douglas, 277; El Paso, 40; Nogales, 853..	1,938
Radish.....do....	Calexico, 3,613; Douglas, 58; Eagle Pass, 29; El Paso, 111,747; Naco, 25; New York, 677; Nogales, 7,618; San Ysidro, 32; Ysleta, 6.	123,805
Roselle.....do....	Nogales, 30	30
St. Johns bread.....do....	New York, 988,102; Norfolk, 110,230	1,098,332
Salsify.....do....	San Ysidro, 1,527	1,527
Shallot.....do....	New York, 616	616
Spinach.....do....	Calexico, 4,862; Douglas, 1,257; El Paso, 37,792; Naco, 495; Nogales, 22,944; San Ysidro, 100; Ysleta, 284.	67,734
Squash.....do....	Calexico, 3,595; Douglas, 7,943; Eagle Pass, 2,495; El Paso, 17,358; Hidalgo, 75; Laredo, 10,163; Mercedes, 576; Miami, 40; Naco, 1,380; New York, 16,618; Nogales, 32,026; San Ysidro, 442; Tampa, 225; Ysleta, 183.	93,119
Strawberry.....do....	El Paso, 7,319; New York, 15; Nogales, 2; San Ysidro, 5.	7,341
Sweetpotato.....do....	Hawaii (all ports), 4,200	4,200
Swiss chard.....do....	El Paso, 11,451	11,451
Tamarind bean pod.....do....	Calexico, 33; El Paso, 775; New Orleans, 630; New York, 198,776; Nogales, 11; San Francisco, 80.	200,305
Tomato.....do....	Boston, 42,247; Brownsville, 6,966; Buffalo, 22,300; Calexico, 8,829; Del Rio, 25; Douglas, 22,108; Eagle Pass, 39,166; El Paso, 220,530; Hidalgo, 716; Key West, 1,770,760; Laredo, 372,390; Los Angeles, 1,784,244; Mercedes, 9; Miami, 1,042,452; Naco, 4,645; New Orleans, 2,081,968; New York; 35,858,569; Nogales, 33,472,327; Presidio, 165; Puerto Rico (all ports), 2,850; Rio Grande City, 20; Roma, 88; San Francsico, 271,254; San Ysidro, 284; Tampa, 575,890; Ysleta, 1,041.	77,601,843
Turnip.....do....	Calexico, 470; Douglas, 50; Eagle Pass, 20; El Paso, 254,356; Naco, 20; New York, 2,778; Nogales, 3,723; San Ysidro, 19; Ysleta, 524.	261,960
Vaccinium (cranberry, etc.):		
Frozen.....do....	Boston, 833,470; New York, 2,664,879	3,498,349
Natural.....do....	Boston, 20,860; Chicago, 34,600; New York, 380,016; Philadelphia, 122,400; Port Huron, 124,600.	682,476
Water caltrop.....do....	Hawaii (all ports), 3,440; New York, 960; Niagara Falls, 600; San Francisco, 6,100; Seattle, 400.	11,500
Waterchestnut.....do....	Blaine, 385; Boston, 46,135; Buffalo, 86,968; Chicago, 70,500; Detroit, 25,500; Hawaii (all ports), 107,526; Los Angeles, 145,490; New York, 400,380; Niagara Falls, 129,046; Portal, 6,000; Portland, 16,020; San Francisco, 507,800; Seattle, 519,438.	2,061,188
Watercress.....do....	Calexico, 37; Douglas, 433; Naco, 215; Nogales, 2,962..	3,647
Waterlily root.....do....	New York, 55,618; Portland, 1,300; San Francisco, 4,600; Seattle, 10,462.	71,980
Watermelon.....do....	Calexico, 2,264; Douglas, 1,860; Key West, 3,120; Mercedes, 75; Miami, 5,850; Naco, 445; New Orleans, 700; New York, 98,420; Nogales, 307,207; Rio Grande City, 92; Roma, 603; San Ysidro, 273.	420,909
Yam.....do....	Hawaii (all ports), 35,411	35,411
Yam bean root.....do....	El Paso, 580; Hawaii (all ports), 1,900; Laredo, 1,420; Los Angeles, 1,900; Niagara Falls, 400; Nogales, 9; San Francisco, 22,900.	29,109

PLANTS AND PLANT PRODUCTS ENTERED FOR EXPORTATION OR FOR TRANSPORTATION AND EXPORTATION

In addition to the regulated imports for consumption entry recorded in tables 22 to 34, this Bureau supervised the entry under permit, either for exportation or for transportation and exportation, of considerable quantities of plants and plant products, as follows: Flower bulbs, corms, and tubers, 416,682; fruit trees, 1,596 and 2 bales[1] and 1 box[1]; cacti, 41,119; orchids, 308 and 2 cases[1]; miscellaneous plants, 38,644, 11 bales[1] and 16 cases[1]; sugarcane, 406 pounds; miscellaneous seeds, 2,418 pounds and 2 cases[1]; apples, 11,450 pounds; beans, string, 4,515 pounds; cauliflower, 3,306 pounds; chestnuts, 460 pounds; cucumbers, 1,000 pounds; eggplants, 55,300 pounds; garlic, 2,141,983 pounds; ginger root, 280 pounds; grapes, 142,490 pounds; grapes, hothouse, 538 pounds; grapefruit, 10,317,288 pounds; lemons, 2,104,305 pounds; lily bulbs, edible, 600 pounds; melons, 17,500 pounds; nectarines, 1,500 pounds; onions, 9,024,898 pounds; oranges, 2,747,727 pounds; peas, 446,708 pounds; peppers, 67,510 pounds; pineapples, 113,543 crates; plums, 9,910 pounds; potatoes, 566,411 pounds; tangerines, 4,000 pounds; tomatoes, 18,319,944 pounds; waterchestnuts, 1,052 pounds; bagging, 2,134 bales; broomcorn, 7,218 bales; shelled corn, 5,129,234 pounds; cotton, 112,284 bales, including 1,816 bales of linters, and 109 packages; cotton waste, 2,971 bales and 1 package; cottonseed, 883,945 pounds; cottonseed cake, 1,140,264 pounds; cottonseed meal, 352,738 pounds; seed or paddy rice, 1,975 pounds; rice straw, 98 bales; and wheat, 7,395 pounds.

MARITIME-PORT INSPECTION

SHIP INSPECTION

Ships from foreign countries and from Hawaii and Puerto Rico are inspected promptly upon arrival for the presence of prohibited or restricted plant material.

The inspection at ports in California, Florida, Hawaii, and at certain ports in Puerto Rico has been performed by State and Territorial officials serving as collaborators of the Bureau of Entomology and Plant Quarantine.

A record by ports of the ship inspection appears in table 35.

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[1] Information as to exact quantity not available.

TABLE 35.—*Number of ships inspected, fiscal year 1935*

Port	From foreign ports											
	Direct			Via United States ports			Via Hawaii			Via Puerto Rico		
	Arrived	Inspected	With contraband	Arrived	Inspected	With contraband	Arrived	Inspected	With contraband	Arrived	Inspected	With contraband
Baltimore	489	478	197	700	686	322						
Bellingham	72	69	21									
Boston	1,265	1,263	606	267	265	136				1	1	0
Brunswick [1]	4	3	2									
Buffalo	4	4	0									
Charleston	146	146	115	133	129	62						
Chicago	2	2	2	16	16	12						
Corpus Christi [2]	17	17	12	81	81	40						
Detroit	12	12	11	6	1	0						
Galveston	240	236	83	486	483	231						
Gulfport [3]	13	12	10	111	71	34						
Honolulu [4]	205	205	107									
Houston	317	316	230	437	436	211						
Jacksonville [4]	160	160	39	135	135	0				2	2	0
Key West [4]	337	334	118	12	12	2						
Miami [4]	766	766	200	15	15	0						
Mobile	156	155	90	368	368	225						
New Orleans	1,083	1,083	588	476	476	304	4	4	2			
Newport News [4]	58	19	18	370	20	19						
New York	3,562	3,515	2,746	877	725	417	1	0	0	130	130	121
Norfolk	261	259	115	736	674	205						
Pensacola [4]	57	57	17	210	210	5						
Philadelphia	679	679	502	920	919	613						
Port Arthur	300	298	160	294	289	96	1	1	0			
Portland, Oreg	111	111	78	386	386	208						
Puerto Rico (all ports)	1,091	1,080	537									
San Diego [4]	1,281	1,281	18	72	72	0						
San Francisco [4]	421	421	37	790	790	44	94	94	57			
San Pedro [4]	1,333	1,333	556	606	606	102	98	98	54	6	6	2
Savannah	82	82	66	208	208	109						
Seattle	1,436	1,333	187	336	336	186	5	5	1			
Tampa [4]	258	258	47	309	309	1						
West Palm Beach [4]	66	66	0									
Total	16,284	16,053	7,515	9,357	8,718	3,584	203	202	114	139	139	123

[1] Work handled by inspector stationed at Savannah, Ga.
[2] This port closed Dec. 1, 1934.
[3] Work handled by inspectors stationed at Mobile, Ala.
[4] Collaborators stationed at these ports.

NOTE.—The foreign ship arrivals do not in all cases agree with customs figures. Foreign ships may put in for bunkers and be inspected by inspectors of the Bureau of Entomology and Plant Quarantine but not entered by customs. On the other hand, ships entered at certain small subports are included in customs records but not in this report.

TABLE 35.—*Number of ships inspected, fiscal year 1935*—Continued

Port	From Hawaii						From Puerto Rico						From United States ports via Panama Canal		
	Direct			Via United States ports			Direct			Via United States ports					
	Arrived	Inspected	With contraband	Arrived	Inspected	With contraband	Arrived	Inspected	With contraband	Arrived	Inspected	With contraband	Arrived	Inspected	With contraband
Baltimore	1	1	0	18	18	0	15	15	3	32	32	8	214	211	5
Bellingham	2	2	0												
Boston				11	11	0	11	11	5	1	1	0	239	239	1
Brunswick [1]															
Buffalo															
Charleston							8	8	2	15	14	5	64	64	3
Chicago															
Corpus Christi [2]										3	3	0	9	9	0
Detroit															
Galveston				1	1	0	11	11	4	4	4	0	13	13	1
Gulfport [3]										2	2	1			
Honolulu [4]													119	119	0
Houston	3	3	2	4	4	0	6	6	2	20	20	2	89	89	11
Jacksonville [4]							11	11	2	8	8	0	53	53	1
Key West [4]															
Miami [4]							3	3	1				3	3	0
Mobile				3	3	0	9	9	8	38	38	11	67	67	1
New Orleans	12	12	7	7	7	0	22	22	2	48	48	1	62	62	4
Newport News [4]							1	1	0				1	0	0
New York	4	4	2	43	34	6	135	134	103	23	12	6	312	212	6
Norfolk							5	5	1	19	19	2	76	76	0
Pensacola [4]	1	1	1				3	3	0	8	8	0			
Philadelphia	1	1	1	22	22	4	56	56	37	10	10	1	311	310	15
Port Arthur				3	3	0	4	4	3	2	2	1	32	31	0
Portland, Oreg	2	2	0	7	7	0							395	395	0
Puerto Rico (all ports)													22	22	11
San Diego [4]	116	116	11										162	162	23
San Francisco [4]	160	160	24	24	24	8							583	583	3
San Pedro [4]	94	94	14	26	26	2							945	944	91
Savannah				4	4	0	12	12	6	4	3	1	38	38	1
Seattle	10	10	1	13	13	1							168	168	2
Tampa [4]							28	28	3	2	2	0			
West Palm Beach [4]															
Total	406	406	63	186	177	21	340	339	182	239	226	39	3,977	3,870	179

CARGO INSPECTION

All importations of plants and plant products subject to plant-quarantine restrictions were inspected at the port of entry or the port of first arrival. A record of such importations by ports appears in table 36.

In addition to the importation credited to the Mexican border ports, there were several thousand importations that were so small that no duty was assessed by customs and no entry made. All these small lots, however, were inspected. It was also necessary to devote considerable time at several ports to the inspection of miscellaneous cargoes in order to establish the true status of the importation and to supervise the cleaning of shipments containing prohibited packing material or contaminated with objectionable material, such as soil.

TABLE 36.—*Inspection of shipments of plants and plant products offered for entry, fiscal year 1935*

Port	Shipments inspected and entered under permit	Shipments refused entry	Port	Shipments inspected and entered under permit	Shipments refused entry
	Number	*Number*		*Number*	*Number*
Baltimore	282	1	Mobile	81	0
Bellingham	71	0	Naco	11	0
Blaine	65	1	New Orleans	1,801	3
Boston	1,490	1	New York	11,901	152
Brownsville	981	0	Nogales	3,502	3
Buffalo	541	0	Norfolk	162	0
Calexico	208	0	Pensacola [2]	0	0
Charleston	147	2	Philadelphia	578	0
Chicago	31	0	Port Arthur	3	0
Corpus Christi [1]	1	0	Port Huron [2]	72	0
Del Rio	11	0	Portland, Oreg	80	2
Detroit	526	6	Presidio	240	0
Douglas	26	0	Puerto Rico (all ports)	481	1
Eagle Pass	1,163	0	Rio Grande City	41	0
El Paso	5,668	0	Roma	82	0
Galveston	224	0	San Diego [2]	6	0
Hidalgo	1,585	2	San Francisco [2]	933	34
Honolulu [2]	449	48	San Pedro [2]	606	0
Houston	167	0	San Ysidro	130	1
Jacksonville [2]	79	0	Sasabe [3]	2	0
Key West [2]	569	0	Savannah	30	1
Laredo	3,929	14	Seattle	613	4
Los Angeles [2]	7	0	Tampa [2]	863	0
Mercedes	65	0			
Miami [2]	189	0	Total	40,692	276

[1] Port closed Dec. 1, 1934. [2] Collaborators stationed at these ports. [3] Port closed June 15, 1935.

DISINFECTION

Disinfection is required of certain commodities as a condition of entry and of other commodities when inspection reveals the presence of injurious insects or plant diseases. During the fiscal year the following plant material was treated under the supervision of inspectors of this Bureau: Cotton, 93,184 bales; cotton linters, 32,256 bales; cotton waste, 64,571 bales; cotton samples, 946; bagging, 327 bales; cottonseed hull fiber, 153 bales; broomcorn, 50,038 bales; rice fiber, 4,313 bales; grapes, 156,542 barrels and 9,314 half barrels and kegs; chestnuts, 5,097 cases and barrels; tree seeds, 36 cases, 13 bags, and 325 packages; miscellaneous plants, 378 lots; narcissus bulbs imported under special permit, 753,958; and bulbous iris, 594,529.

In addition to the above, there were treated at the inspection house at Washington, D. C., various shipments of plant material and cotton samples as shown in table 41.

AIRPLANE INSPECTION

Three thousand one hundred and fifty airplanes arriving from foreign countries and Hawaii were inspected during the fiscal year. These airplanes arrived at the following 15 ports of entry: Calexico, Los Angeles, San Diego,

and San Francisco, Calif.; Nogales, Ariz.; Miami, Tampa, and West Palm Beach, Fla.; San Juan, P. R.; Brownsville, Eagle Pass, El Paso, Laredo, and Presidio, Tex.; and Seattle, Wash. A total of 918 interceptions of prohibited and restricted plant material were taken from 537 airplanes.

FOREIGN PARCEL-POST INSPECTION

Through cooperation with customs and post-office officials, mail packages from foreign countries which are found to contain plants or plant products are referred to inspectors of this Bureau for examination. Such packages arriving at ports of entry where no plant quarantine inspectors are stationed are forwarded by the postal officials to the nearest port where inspection can be made.

Table 37 indicates by ports the number and disposition of foreign mail packages inspected during the fiscal year.

Table 37 includes shamrocks, which are permitted entry through the mails provided they are free from soil. It has not been the policy to include such importations in the annual reports for the past few years but, inasmuch as they represent a considerable amount of work, it seems desirable that they now be shown. Of the number of packages listed above as inspected, the following represent shamrocks: Boston, 8,550; Chicago, 4,885; Detroit, 640; Los Angeles, 388; New York, 31,509; Philadelphia, 3,581; St. Paul, 561; San Francisco, 748; and Seattle, 128.

TABLE 37.—*Foreign parcel-post packages inspected, fiscal year 1935*

Port	Inspected	Refused entry (entire or in part)	Diverted to Washington	Port	Inspected	Refused entry (entire or in part)	Diverted to Washington
	Number	*Number*	*Number*		*Number*	*Number*	*Number*
Atlanta [1]	42	3	18	Naco	58	0	0
Baltimore	2,400	64	226	New Orleans	237	20	99
Boston	10,306	87	806	New York	45,908	1,536	2,401
Brownsville	595	13	17	Nogales	423	23	5
Buffalo	67	25	7	Philadelphia	10,314	324	733
Chicago	8,830	491	270	Portland, Oreg. [3]	18	6	1
Detroit	4,351	161	257	Puerto Rico (all ports)	3	1	0
Eagle Pass	335	2	2	St. Paul [1]	8,174	156	158
El Paso	884	157	26	San Diego [1 4]	70	0	0
Honolulu [1]	441	19	0	San Francisco [1]	5,428	224	0
Jacksonville [1]	560	75	90	Seattle	1,634	92	2
Laredo	629	42	3	Washington, D. C.	753	13	
Los Angeles [1 2]	4,949	148	0				
Miami [1]	40	38	1				
Mobile	1	1	0	Total	107,450	3,721	5,122

[1] Collaborators are stationed at these ports.
[2] 394 packages diverted to San Francisco for treatment.
[3] 8 packages diverted to Seattle for treatment.
[4] 1 package diverted to San Francisco for treatment.

MEXICAN-BORDER SERVICE

The increase in the movement of railway cars from Mexico which took place during the fiscal year 1934 continued during the fiscal year 1935. A total of 30,736 freight cars were inspected in the Mexican railway yards. Of this number 28,422 entered the United States and 6,841 were fumigated as a condition of entry. This represents an increase of 74+ percent in the number of cars inspected, 73+ percent in the number of cars that entered, and 26+ percent in the number of cars fumigated over the fiscal year 1934. Of the total number inspected, 1,507 cars were found to be contaminated with cottonseed. Cleaning was required as a condition of entry. The usual fee of $4 was charged for each car fumigated and all fees collected were covered into the Treasury as miscellaneous receipts. A summary of the railway-car inspection and fumigation is given in table 38. In addition to the freight cars listed in table 37, 4,368 Pullman and passenger coaches crossed the border and were inspected.

TABLE 38.—*Inspection and fumigation of railway cars crossing the border from Mexico, fiscal year 1935*

Port	Cars inspected	Cars with cotton-seed	Cars entered	Cars fumigated	Fees collected
	Number	*Number*	*Number*	*Number*	*Dollars*
Brownsville	693	24	656	16	64
Douglas	899	18	899	34	136
Eagle Pass	2,262	209	1,938	903	3,700
El Paso	6,976	354	5,829	[1] 1,245	4,448
Laredo	12,567	703	12,032	3,417	13,868
Naco	717	29	716	14	56
Nogales	6,388	132	6,118	1,131	4,600
Presidio	234	38	234	81	324
Total	30,736	1,507	28,422	6,841	[2] 27,196

[1] Includes 31 cars not from Mexico.
[2] The apparent discrepancy in fees collected and the number of cars fumigated may be explained by the fact that it is customary for the railroads to purchase fumigation coupons in advance.

Plant-quarantine inspectors at Mexican border ports take an active part, in cooperation with the customs service, in the inspection of vehicles, baggage, personal effects, and express packages from Mexico. A total of 205,835 pieces of baggage and between 3,500,000 and 4,000,000 vehicles, including 56,233 street cars, were inspected. This inspection resulted in the interception of a considerable quantity of prohibited and restricted plant material. A record of such interceptions appears in table 43.

INSPECTION IN PUERTO RICO AND HAWAII

In addition to the enforcement of the foreign-plant quarantines and regulatory orders, the inspectors stationed in Puerto Rico also enforce the provisions of Quarantine No. 58. This involves the inspection of fruits and vegetables in the fields, in packing houses, and on the docks, and all shipments of such products moving to the mainland have been certified as free from pests.

Inspection is also made of parcel-post packages originating on the island and destined for points in continental United States. A total of 738 packages were inspected and 60 were found to contain prohibited plant material and were returned to the sender.

A record by months of the amounts of fruits and vegetables inspected and certified for shipment to the mainland appears in table 39.

Inspectors stationed in Hawaii are engaged principally with the enforcement of Quarantine No. 13 on account of the Mediterranean fruit fly and the melon fly. Inspections were made in the fields, in packing sheds, and on the docks of such fruits and vegetables as are permitted to move to the mainland.

Inspection was also made of parcel-post packages originating in the Hawaiian Islands and destined for points on the mainland. A total of 89,843 packages were opened and examined, 99,344 packages were inspected without being opened, and 89 packages were found to contain prohibited plant material.

As an accommodation to travelers between Hawaii and the mainland baggage is inspected and sealed in Honolulu. During the fiscal year 2,543 pieces of baggage were inspected and sealed under this arrangement.

In both Hawaii and Puerto Rico valuable assistance was rendered by insular plant-quarantine inspectors serving as collaborators.

A record of the amounts of fruits and vegetables inspected and certified for shipment from Hawaii to the mainland appears in table 40.

TABLE 39.—*Summary of shipments of fruits and vegetables moving from Puerto Rico to the mainland, inspected and certified under Quarantine No. 58, fiscal year 1935*

Item	July	August	September	October	November	December	January	February	March	April	May	June	Total
Arrowroot pounds								60					60
Avocados do		60	50										110
Bananas bunches	91	46	89	206	57	58	5	1	6		6	65	630
Breadfruit pounds	1,140	4,000	6,050	6,700	2,400	4,320	1,220	640	4,500	2,460	1,140	1,480	36,050
Cabbage do									7,320	6,120			13,440
Celery root do			35	35	125					90	180	540	1,005
Chayotes do	2,115	2,255	3,615	4,545	4,895	11,415	4,420	3,960	6,765	3,175	950	3,880	51,990
Citrons do					60				480				540
Cucumbers do				120	1,800	35,380	870,230	1,208,380	506,550	295,370	5,400		2,923,230
Cucumbers (Angola) do			125		260	60						140	585
Dasheens do	2,730	3,620	3,650	6,520	10,255	23,640	12,640	25,475	50,445	69,055	42,515	80,540	331,085
Eggplants do				240		2,260	1,740	1,740	5,740	4,100	1,980	180	17,980
Ginger root do	12,290	9,220	8,015	11,630	13,200	2,955	5,290	7,850	4,080	7,520	12,950	790	95,790
Grapefruit do	1,147,230	829,800	5,066,820	2,671,470	326,520	220,140	58,260	135,540	441,630	2,321,640	1,565,010	4,356,540	19,140,600
Lemons do	2,070	810	900			1,980	180					270	6,210
Lerenes do						340	260	120	160	180			1,060
Lima beans do					35			180	1,415	70			1,700
Limes do	11,470	8,270	14,870	29,070	17,730	7,470	8,190	5,130	2,970	1,710	4,050	9,270	120,200
Mixed (fruits and vegetables) do	60			270	540	7,120	2,280	3,150	1,390	1,380	810	1,770	18,770
Onions do									4,320	120			4,440
Oranges do	4,320		34,650	203,400	571,435	328,860	245,520	21,420	67,770	4,770	450	180	1,482,775
Oranges (sour) do				180	900	2,430	90	4,500			90		8,190
Papayus do	1,225	780	390	275	540	3,010	1,380	120	360	480	2,360	1,610	12,530
Parsley do	355	740	824	665	720	880	765	650	1,650	1,675	1,250	1,910	12,084
Peas (garden) do							700	2,360	3,540	250			6,850
Peppers do				225			25,505	43,825	26,425	35,410	14,140	4,315	149,845
Peppers (small) do	630	958	590	695	730	580	640	560	1,045	2,280	1,065	740	10,513
Pigeon peas do					12,425	52,610	45,525	47,265	63,870	4,410			226,105
Pineapples crates	10,182	13,362	5,046	1,233	1,050	966	1,985	15,125	69,109	84,368	99,432	56,433	358,291
Pineapples half crates	2,141	5,554	3,488	1,286	1,701	2,431	1,743	4,958	12,105	12,763	8,180	13,560	69,910
Plantains pounds						120				300			420
Potatoes do								4,800	16,240	10,200			31,240
Pumpkins do	11,560	15,985	17,905	18,280	19,870	30,880	8,915	22,850	24,650	32,365	15,890	17,795	236,945
Quenepas do	1,500	6,830	2,840	560			380				60	440	12,610
Squash do						5,800	33,260	56,400	30,740	840			127,040
String beans do						5,000	53,275	17,895	22,330	9,275			107,775
Sweet corn do					300		180						480
Tamarinds do	540	120									1,130	280	2,070
Tangerines do					5,580								5,580
Tomatoes do								3,335	17,380	16,400	1,325		38,440
Watermelons do						300	2,080						2,380
Yams do				25,645	84,215	78,830	35,085	31,580	26,115	14,270	23,420	16,800	335,960
Yuca do						40							40
Certificates	164	152	242	239	147	198	214	229	279	238	263	401	2,766

TABLE 40.—*Fruits and vegetables inspected and certified for shipment from Hawaii to the mainland, fiscal year 1935*

Month	Bananas	Pineapples	Taro	Ginger root	Swamp cabbage	Potatoes	Waternuts	Papaya (processed)
	Bunches	*Crates*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
July	4,535	1,872	------	2,237	------	------	------	------
August	8,910	4,030	8,100	9,585	------	------	------	------
September	8,517	2,319	7,449	10,444	------	------	------	------
October	11,099	4,817	6,940	13,745	------	------	------	------
November	10,899	2,274	1,195	15,665	------	------	------	------
December	10,543	4,717	1,540	18,900	------	------	------	------
January	5,883	2,196	630	2,862	140	7,000	------	------
February	7,429	3,581	1,275	12,450	315	351,965	------	------
March	7,298	5,231	700	3,650	350	450,429	------	------
April	5,820	4,627	1,650	6,674	1,240	102,154	------	------
May	6,594	4,496	400	5,015	1,440	160	165	15
June	6,065	4,778	3,310	10,240	2,420	------	------	------
Total	93,592	44,938	33,189	111,517	5,905	911,708	165	15

Month	Avocado (frozen)	Avocado pulp (frozen)	Coconuts	Podded peas	Yam bean roots	Yams	Lily roots [1]	Burdock roots	Permits issued
	Pounds	*Pounds*	*Number*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Number*
July	------	------	19	------	------	------	19,500	------	92
August	------	------	25	------	------	------	14,975	------	184
September	------	50	4,447	------	------	------	24,740	------	146
October	------	465	6,850	------	------	------	24,190	45	199
November	------	2,100	529	------	------	1,080	28,200	------	175
December	------	------	14,209	------	------	3,315	42,840	------	216
January	------	------	36	125	620	1,175	23,500	------	131
February	------	------	4,943	------	130	------	21,760	------	189
March	------	------	2,415	------	145	------	24,690	------	168
April	------	------	140	------	220	300	21,500	------	155
May	15	------	38	------	160	------	7,650	------	150
u ne	------	------	163	------	------	250	------	------	178
Total	15	2,615	33,814	125	1,275	6,120	253,545	45	1,983

[1] The edible root (*Nelumbium nelumbo*) is also well known to the trade as lotus root.

INSPECTION OF SPECIAL-PERMIT AND DEPARTMENTAL PLANT MATERIAL

As in previous years, all plants imported under special permit have been inspected at ports of entry designated for such material. A tabular record of special-permit importations is presented in table 25. The majority of such special-permit importations have been, as in former years, inspected at Washington, D. C., and these, together with departmental importations and distributions from Washington, including domestic plants entering and leaving the District of Columbia, are inspected and certified for shipment at the Department inspection house, in the nursery, or in freight, express, or post offices. A summary of the inspections made at Washington, D. C., is given in table 41.

TABLE 41.—*Summary of plants and plant products offered for inspection in the District of Columbia, fiscal year 1935*

Material inspected	Foreign	Domestic	Fumigated	Otherwise treated	Infested with insects	Infected with diseases
Lots of seeds (departmental)	5,550	3,863	4,855	501	892	284
Plants, cuttings, bulbs, roots, rhizomes, etc. (departmental)	13,281	71,620	15,610	7,366	[1] 369	[1] 207
Miscellaneous unclassified material, other than plants and seeds (departmental)	206	89	74	22	4	2
Shipments of plants under regulation 14, Quarantine No. 37 (commercial)	1,179	----	250	94	344	302
Shipments of plants and plant products under regulations 3 and 15, Quarantine No. 37 (commercial)	721	----	401	54	66	51
Containers of domestic plants other than departmental (mail, express, freight, and truck)	----	8,900	----	----	----	----
Shipments of plants by private individuals	----	2,910	10	89	99	45
Interceptions of plants and plant products referred to Washington, D. C	1,263	----	517	143	105	39
Cotton samples referred to Washington, D. C	17,417	----	17,417	----	----	----

[1] Lots.

INSPECTION OF PLANT-INTRODUCTION AND PROPAGATING GARDENS

As heretofore, plants grown and distributed by the Bureau of Plant Industry from its plant-introduction and propagating gardens were inspected and certified prior to shipment. Plants shipped from Mandan, N. Dak., Coconut Grove, Fla., and Chico, Calif., were inspected by officials of the States concerned, cooperating with this Bureau. Those distributed from Savannah, Ga., were examined by an inspector of this Bureau. Table 42 indicates the number of plants inspected and certified for distribution.

TABLE 42.—*Plants, budsticks, cuttings, tubers, roots, and shipments of seeds examined for distribution from plant-introduction and propagating gardens, fiscal year 1935*

Station	Plants	Budsticks, cuttings, tubers, and roots	Shipments of seeds	Station	Plants	Budsticks, cuttings, tubers, and roots	Shipments of seeds
	Number	*Number*	*Number*		*Number*	*Number*	*Number*
Bell, Md	48,952	1,806	----	Mandan, N. Dak	312,887	----	----
Chico, Calif	9,317	538	81	Beltsville, Md	4,321	----	----
Coconut Grove, Fla	1,752	1,936	33	Total	387,838	30,984	11,289
Savannah, Ga	341	2,127	----				
District of Columbia	10,268	24,577	11,175				

INTERCEPTIONS OF PROHIBITED AND RESTRICTED PLANTS AND PLANT PRODUCTS

A record of the number of interceptions of prohibited and restricted plants and plant products appears in table 43. Many of these interceptions were found to harbor insect pests and plant diseases and many others, while showing no infestation or infection, must be considered potentially dangerous, as they came from countries where pests not present in this country are known to occur.

Interceptions made at bridges, ferries, and crossings at the Mexican and Canadian border ports have all been considered as having been taken from baggage.

TABLE 43.—*Number of interceptions of prohibited and restricted plants and plant products, fiscal year 1935*

Port	In baggage		In cargo		In mail		In quarters		In stores		Total	
	Prohibited	Restricted	Prohibited	Restricted	Prohibited	Restricted	Prohibited	Restricted	Prohibited	Restricted	Prohibited	Restricted
Baltimore	0	1	16	1	9	42	36	4	82	5	143	53
Bellingham	1	1	------	------	------	------	0	1	22	27	23	29
Blaine	543	976	------	------	------	------	------	------	------	------	543	976
Boston	66	148	4	1	22	92	10	4	5	0	107	245
Brownsville	3,230	300	------	------	0	30	------	------	------	------	3,230	330
Brunswick [1]	------	------	------	------	------	------	3	0	------	------	3	0
Buffalo	1	190	------	------	4	29	------	------	------	------	5	219
Calexico	2,044	81	------	------	------	------	------	------	------	------	2,044	81
Charleston	2	0	------	------	------	------	100	19	6	6	108	25
Chicago	1	0	10	0	223	310	------	------	------	------	234	310
Corpus Christi [2]	------	------	------	------	------	------	5	4	2	1	7	5
Del Rio	590	74	------	------	------	------	------	------	------	------	590	74
Detroit [3]	12	572	13	5	53	133	------	------	------	------	78	710
Douglas	537	107	------	------	------	------	------	------	------	------	537	107
Eagle Pass	1,537	184	------	------	1	1	------	------	------	------	1,538	185
El Paso	8,261	1,837	------	------	20	132	------	------	------	------	8,281	1,969
Fabens [4]	145	22	------	------	------	------	------	------	------	------	145	22
Galveston	3	6	2	2	------	------	62	5	20	1	87	14
Gulfport [5]	------	------	------	------	------	------	7	0	6	1	13	1
Hidalgo	1,209	79	------	------	------	------	------	------	------	------	1,209	79
Honolulu [6]	515	204	141	3	8	3	------	------	2	4	666	214
Houston	3	1	------	------	------	------	181	18	18	1	202	20
Jacksonville [6]	1	1	------	------	48	29	7	12	23	8	79	50
Key West [6]	134	341	9	7	------	------	2	42	9	8	154	398
Laredo	4,737	431	------	------	11	1	------	------	------	------	4,748	432
Los Angeles [6]	3	2	0	1	74	79	------	------	1	0	78	82
Mercedes	345	48	------	------	------	------	------	------	------	------	345	48
Miami [6]	402	902	9	3	8	32	130	563	26	34	575	1,534
Mobile	2	4	1	1	------	------	21	17	23	11	47	33
Naco	71	25	------	------	------	------	------	------	------	------	71	25
New Orleans	360	366	17	4	3	1	581	108	77	14	1,038	493
New York	1,523	1,778	289	211	309	1,540	282	123	104	12	2,507	3,664
Nogales	2,349	612	------	------	0	23	------	------	------	------	2,349	635
Norfolk	------	------	1	0	------	------	33	106	22	7	56	113
Pensacola [6]	------	------	------	------	------	------	18	6	19	3	37	9
Philadelphia	6	9	23	8	91	246	86	42	82	26	288	331
Port Arthur [7]	0	2	2	0	------	------	71	14	23	1	96	17
Port Huron [6]	0	73	------	------	------	------	------	------	------	------	0	73
Portland, Oreg	1	0	4	0	3	4	------	------	8	3	16	7
Presidio	225	38	------	------	------	------	------	------	------	------	225	38
Puerto Rico (all ports)	42	66	------	------	------	------	4	5	1	0	47	71
Rio Grande City	48	11	------	------	------	------	------	------	------	------	48	11
Roma	275	55	------	------	------	------	------	------	------	------	275	55
St. Paul [6]	------	------	------	------	17	142	------	------	------	------	17	142
San Diego [6]	11	4	------	------	------	------	8	0	31	8	50	12
San Francisco [6]	181	21	25	3	26	13	123	50	84	11	439	98
San Pedro [6]	106	78	4	0	------	------	50	19	125	26	285	123
San Ysidro	4,636	1,041	------	------	------	------	------	------	------	------	4,636	1,041
Sasabe [8]	74	17	------	------	------	------	------	------	------	------	74	17
Savannah	1	0	------	------	------	------	108	10	21	4	130	14
Seattle	74	40	3	0	23	31	2	0	1	0	103	71
Tampa [6]	3	3	0	1	------	------	19	8	35	3	57	15
West Palm Beach [6]	0	2	------	------	------	------	0	11	0	1	0	14
Ysleta	372	22	------	------	------	------	------	------	------	------	372	22
Total	34,682	10,775	573	251	953	2,913	1,949	1,191	878	226	39,035	15,356

[1] Work handled by inspector stationed at Savannah, Ga.
[2] Port closed Dec. 1, 1934.
[3] Interceptions in baggage are recorded at 1 customs station only, and the number reported represents only part of the total for Detroit.
[4] Port closed June 1, 1935.
[5] Work handled by inspectors stationed at Mobile, Ala.
[6] Collaborators stationed at these ports.
[7] Includes interceptions made at Beaumont and Sabine, Tex., and Lake Charles, La.
[8] Port closed June 15, 1935.

PESTS INTERCEPTED

During the fiscal year the inspectors and collaborators of the Bureau collected from foreign plants and plant products insects belonging to 1,680 recognized species and others distributed among 1,488 genera and families, fungi and bacteria belonging to 280 recognized species, plant-parasitic nematodes belonging to 14 recognized species, and numbers of interceptions of diseases caused by fungi, bacteria, nematodes, or other agents that could be referred to family, genus, or other group only. Many of these interceptions were of considerable economic or scientific importance.

A total of 44,754 interceptions of insects and plant diseases were made during the fiscal year 1935. A summary of the interceptions appears in table 44.

TABLE 44.—*Number of interceptions of insects and plant diseases made during the fiscal year 1935*

Port	Cargo		Stores		Baggage		Quarters		Mail		Total	
	Insects	Diseases	Insects	Diseases	Insects	Diseases	Insects	Diseases	Insects	Diseases	Insects	Diseases
Baltimore	254	31	109	146	1	1	36	22	36	14	436	214
Bellingham	6	5	3	3	2	0	0	0	0	0	11	8
Blaine	5	4	0	0	7	2	0	0	0	0	12	6
Boston [1]	81	62	192	187	58	13	18	6	36	12	385	280
Brownsville	44	3	2	0	230	4	26	0	0	0	302	7
Buffalo	0	17	0	0	0	0	0	0	0	0	0	17
Calexico	0	0	0	0	30	1	0	0	0	0	30	1
Charleston	441	15	9	58	0	0	2	0	0	0	452	73
Chicago	1	4	0	1	0	1	0	1	15	6	16	13
Corpus Christi [2]	0	0	9	23	0	0	1	1	0	0	10	24
Del Rio	0	0	0	0	13	0	0	0	0	0	13	0
Detroit	42	49	3	7	1	0	0	0	19	31	65	87
Douglas	0	0	0	0	22	3	0	0	0	0	22	3
Eagle Pass	79	3	1	0	95	5	0	0	0	0	175	8
El Paso	133	39	1	1	208	123	0	0	5	2	347	165
Fabens [3]	0	0	0	0	4	1	0	0	0	0	4	1
Galveston	587	4	33	109	3	0	23	4	0	0	646	117
Hawaii	93	0	4	0	104	0	1	0	107	0	309	0
Hidalgo	8	4	0	0	39	9	0	0	0	0	47	13
Houston	20	4	55	174	1	0	13	1	0	0	89	179
Jacksonville [4]	9	0	20	85	0	0	3	0	5	7	37	92
Key West [4]	3	0	1	6	11	2	2	0	0	0	17	8
Laredo	730	16	1	0	134	1	0	0	0	0	865	17
Los Angeles [4]	2	0	0	0	1	0	0	0	12	0	15	0
Miami [4]	79	6	45	18	292	15	126	6	4	2	546	47
Mobile [5]	679	3	116	385	2	6	20	7	0	1	817	402
Naco	5	0	0	0	28	0	0	0	0	0	33	0
New Orleans	1,908	146	368	554	86	23	250	84	29	6	2,641	813
New York	6,824	2,907	3,573	1,398	1,853	640	764	143	247	172	13,261	5,260
Nogales	2,983	615	1	8	389	123	0	2	6	0	3,379	748
Norfolk	49	4	4	10	0	0	5	3	0	0	58	17
Pensacola [4]	0	0	34	80	0	0	13	0	0	0	47	80
Philadelphia	1,698	261	438	1,010	6	8	207	109	192	155	2,541	1,543
Port Arthur	12	1	45	135	0	0	14	3	0	0	71	139
Portland	5	3	2	2	7	0	0	0	2	0	16	5
Presidio	35	0	0	0	4	1	0	0	0	0	39	1
Rio Grande City	0	0	0	0	2	2	0	0	0	0	2	2
Roma	1	0	0	0	0	0	0	0	0	0	1	0
San Diego [4]	2	0	24	7	3	1	5	0	1	0	35	8
San Francisco [4]	553	40	181	54	285	9	199	3	285	8	1,503	114
San Juan	3	2	1	0	7	1	0	0	0	1	11	4
San Pedro [4]	247	4	193	55	83	4	43	1	0	0	566	64
San Ysidro	23	3	0	0	22	4	0	0	0	0	45	7
Sasabe [6]	0	0	6	0	0	0	0	0	0	0	6	0
Savannah	0	0	24	52	0	0	8	0	0	0	32	52
Seattle	260	65	59	26	75	21	109	30	46	60	549	202
Tampa [4]	19	11	16	74	2	1	4	0	0	0	41	86
Thayer	0	0	0	0	1	0	0	0	0	0	1	0
Washington, D. C.	830	359	0	0	9	1	0	0	1,454	619	2,293	979
Ysleta	0	0	0	0	4	2	0	0	0	0	4	2
Miscellaneous	2	0	0	0	0	0	0	0	1	0	3	0
Total	18,755	4,690	5,573	4,668	4,124	1,028	1,892	426	2,502	1,096	32,846	11,908

[1] Includes interceptions at Providence, R. I.
[2] Closed Dec. 6, 1934.
[3] Closed June 1, 1935.
[4] Collaborators stationed at these ports.
[5] Includes interceptions at Gulfport, Miss.
[6] Closed June 15, 1935.

CERTIFICATION FOR EXPORT

During the fiscal year 1935 a total of 6,907 shipments, representing 2,792,029 containers of plants and plant products, were inspected and certified for export to meet the sanitary requirements of foreign countries. While this represents a decrease of 315 in the number of shipments, there was an actual increase of 71,555 in the total number of containers certified over the fiscal year 1934.

Certificates were issued at 26 ports and covered 58 different commodities which were exported to 58 foreign countries. Some of the more important commodities inspected and certified were: Apples, 2,148 shipments, consisting of 1,255,142 boxes, 86,190 baskets, and 38,964 barrels; pears, 842 shipments, consisting of 508,341 boxes; potatoes, 1,126 shipments, consisting of 300,770 bags, 13,810 barrels, and 8,410 crates and boxes; oranges, 479 shipments, consisting of 294,597 boxes; grapefruit, 160 shipments, consisting of 24,005 boxes; miscellaneous fruits and vegetables, 1,190 shipments, consisting of 108,539 containers. The certification of apples and pears was conducted cooperatively with the Bureau of Agricultural Economics.

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